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THE IMPACT OF STRUCTURAL CHANGE ON POTENTIAL INSTABILITY IN THE WORLD WHEAT MARKET

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Nancy E. Schwartz and David Blandford

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Abstract

The relative decline in wheat consumption in the developed countries is reducing the potential stabilizing effect on the world market of freer trade in these countries. Furthermore, the growing role of centrally-planned countries as importers is increasing the potential instability in world wheat import demand.

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Instability in the world wheat market and the means through which it might be reduced, remains a lively topic for debate among agricultural economists, as well as within international fora. A considerable amount of analysis has focused on the impact of trade policies of developed countries such as the European Community on world market instability (e.g., D. G. Johnson; Shei and Thompson; Josling). It is suggested that the elimination of policies which insulate domestic markets from changes in the world market (so-called insulating policies) would substantially reduce future instability in world prices and supplies. This paper argues that the potential stabilizing effect of freer trade policies in the developed countries is diminishing because of structural changes in the world wheat market, and also that such changes are increasing the potential instability in the market.

The paper divides the world into three major groups -- the developed countries (DC's), less developed countries (LDC's), and centrally planned countries (CPC's).[1/] It examines the implications of relative changes in consumption and imports, and of the potential transmission of production instability, to import demand.

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The Implications of Changes in Consumption Shares

The argument that freer trade policies in developed countries would be a major stabilizing factor in the world wheat market is predicated on the ability of DC consumption response to help balance fluctuations in the rest of the world market. The reasoning essentially runs as follows: a large portion of world wheat consumption is currently isolated from the world market by trade-insulating policies in the DCs. These policies help maintain stable domestic consumption by separating the domestic market from world conditions. The elimination of protectionist policies would cause internal prices to rise and domestic consumption to fall when world supplies were tight. The reverse would occur in a glut situation. Thus, the DCs would help to buffer the world market through adjustments in their domestic consumption.[2/]

The degree to which the DCs could contribute to future stability in the world market through the adoption of a freer trade regime is probably not as great as has been implied, in part because the DC share in world consumption has been declining steadily over the last two decades (table 1). Their share of world consumption fell from an average of 31 percent during 1960-62 to 21.5 percent in 1977-79. If the U.S. is excluded as being a relatively open wheat market, then the share is reduced to 16 percent in 1977-79. The European Community (EC-9) often identified as the prime example of insulation accounts for less than 10 percent in 1977-79 down from 16 percent in 1960-62. Although part of the relative decline in consumption may be due to higher internal prices through trade insulation, it is unlikely that by opening up trade, the relative size of DC consumption would rise substantially, since the region exhibits both low price and income elasticities of demand and low population growth rates.[3/]

Trend rates of growth, also given in table 1, suggest that DC consumption may be expected to decline relative to that in the LDC's and CPC's. As this occurs the potential buffering effect of DC free trade adjustment will become less and less significant.

The Implications of Changes in Import Shares

Table 1 indicates that the average annual rate of growth in production has been greater than the rate of growth in consumption in the importing DC's and less than the rate of growth in consumption in both the LDC's and CPC's. As a consequence, the DC import share has fallen from an average of roughly 36 percent in 1960-62 to 21 percent in 1977-79. Conversely, the LDC share has risen from 39 percent to 52 percent and the CPC share from 21 percent to 28 percent. These changes in share have important implications for the potential instability in the world wheat market.

In all three regions, deviations in imports around linear trend are negatively correlated with deviations in production (excluding exporters) around linear trend (table 2). The simple correlation coefficient values are -.58 for the DC's, -.64 for the LDC's and -.48 for the CPC's. If import deviations are regressed on production deviations it is possible to derive an estimate of the import/production elasticity for each region, that is the percentage change in imports from trend associated with a one percent change in production from trend. The elasticities, estimated at the mean, are -1.02 for the DC's, -.79 for the LDC's and -1.56 for the CPC's. The regression results from which these elasticities were obtained are given in table 2.

Due to the change in import shares and the differential import/production elasticities, the potential transmission of production instability

from importing countries to the world market has changed over the period. In order to demonstrate this, the coefficient of variation for world production (including exporting countries) was computed for 1960-78 using absolute average deviations around linear trend. The result, which indicates an average annual production variability of roughly 4.5 percent (table 3), was multiplied by each of the regional import/production elasticities evaluated for 1961 and 1978 and then by "normal" regional imports (given by the arithmetic averages for 1960-62 and 1977-79). The results in table 3 approximate the potential fluctuation in import demand in each year if all regions were to experience a fluctuation in production in the same direction, equal to the world average for the period 1960-78. For example, given DC imports in 1961 and an import/production elasticity of -.99, a proportionate increase (decrease) in production equivalent to the world average for 1960-78, would result in a decrease (increase) in potential import demand of 0.72 million metric tons. In 1978 the corresponding figure is 0.77 million metric tons.

These figures show an increase in the potential absolute fluctuation in import demand resulting from the combined effect of actual changes in import market shares and differential import/production elasticities. As table 3 shows, there is a slight increase in absolute potential variability in the import demand of the DC's and a significant increase in the potential variability of LDC and CPC import demand. Aggregation of the regional estimates to derive a world total indicates that a potential fluctuation of 1.92 million metric tons in 1961 had risen to 3.88 million metric tons in 1978.[4/] When these figures are compared to the corresponding actual average imports then relative potential variability rises from 4.4 percent in 1961 to 4.9 percent in 1978.

These calculations assume that all regions are potentially subject to the same relative fluctuation around production trend. As the regional coefficients of variation given in table 3 indicate, this is not the case. During 1960-78 the average production variability net of trend was roughly 7 percent per annum in the CPC's, 5 1/2 percent in the LDC's and 5 percent in the DC's. In order to explore the impact of differential production instability, potential import fluctuations were recalculated using the regional coefficients of variation. As might be expected, since the regional coefficients for importers are all greater than that for the world as a whole (including exporters), the absolute magnitudes of potential import variability are greater in each region than for the previous calculations. The world aggregate for potential import instability increases from 2.50 million metric tons in 1961 to 5.3 million metric tons in 1978. Relative to world imports, potential instability is increased from 5.7 percent to 6.7 percent.

The percentage increase in potential import fluctuation from 1961 to 1978 under the assumption of a common relative production fluctuation in all regions is 102 percent. When differential production fluctuations are taken into account the increase is 118 percent. Therefore, potential import instability in the world wheat market is increasing not only because of the relative shift in the structure of import demand across regions, but also because those regions who are gaining are subject to greater relative production variability.

Conclusion

This preliminary analysis suggests that the future ability of freer trade in the developed market economies to damp fluctuations in the world wheat market is declining as their share in world consumption decreases. Furthermore, the growth in the import shares of the developing and the centrally planned economies means that potential instability in the world market is increasing, because of their higher production variability and the degree of transmission of this variability to the world market.

The assumption of this paper is that the import shares for the CPCs and LDCs will be at least as great in the future as they have been in the late 1970's. This depends in large part on whether the policies which have led to import expansion by these countries are continued, which appears to be the case, at least for the near term.

The paper is only a partial study of changing market structure and instability in the world wheat market. Nevertheless, the results have a number of important implications. For economists, the results imply that as the DCs role in the import market declines (along with presumably their share of total purchases from the U.S.), then relatively less resources should be devoted to analyzing their market behavior. Conversely, more effort should be concentrated on analysis of the import behavior and future prospects in other regions, especially in the CPCs, where production variability and its transmission into the world market is the highest in both absolute and relative terms (e.g. Barker and Sisler, Sisler and Mellor). For policymakers, as the world market becomes more unstable, the need to consider stabilization measures such as national or international reserves increases.

Table 1. World Wheat: Changes in Consumption, Production and Imports, 1960-78.

Regional Aggregate	Shares of World Total				Average Annual Rate of[a] Growth (Percent)	
	Consumption		Imports			
	Average[b] 1960-62	Average 1977-79	Average[b] 1960-62	Average 1977-79	Consumption	Production
Developed Countries	.308 (.240)[c]	.215 (.162)[c]	.357	.209	0.1 (0.7*)[d]	1.9 (1.2)[d]
Less-Developed Countries	.239	.295	.387	.516	3.0 (5.3*)[d]	2.9 (3.1)[d]
Centrally-Planned Countries	.445	.490	.214	.275	2.5	2.4
World	1.000	1.000	1.000	1.000	2.3	2.4

a/ Computed from linear trends. In all cases the trend coefficient was statistically significant at the 1 percent level or above (two-tailed test). Equations estimated by OLS except where indicated by *. Asterisk denotes GLS (Cochrane-Orcutt procedure) used to correct for 1st order autocorrelation.

b/ Shares do not sum to unity because of exclusion of "undesignated" areas.

c/ Share excluding the U.S.

d/ Rates excluding major exporters (U.S., Canada, Australia and France for DC's and Argentina for LDC's).

Source: Computed from U.S.D.A. OASIS Data Bank.

Table 2. Relationship Between Fluctuations in Production and Imports, 1960-78. a/

Region	Correlation Between Import Fluctuations and Production Fluctuations	Regression of Import Fluctuations on Production Fluctuations b/		
		Estimator	Intercept	Slope
Developed c/ Countries	-.58	GLS	-25.0432 (-0.04)	-0.4949 (-5.93)
Less-Developed d/ Countries	-.64	GLS	507.5920 (0.48)	-0.3932 (-5.87)
Centrally-Planned Countries	-.48	OLS	0.0072 (-.00001)	-.1599 (-2.22)

a/ Measured as deviations from linear trends.

b/ Figures in parentheses denote ratio of coefficient to its standard error.

c/ Excludes U.S., Canada, Australia and France.

d/ Excludes Argentina.

Table 3. Analysis of Potential Instability in World Wheat Import Demand.

Region[a/]	"Normal" Total Imports[b/]		Import/Production[d/] Elasticities		Average Annual[e/] Variation in Production Net of Trend 1960-78	Potential Change in Imports[f/] With Average World Production Fluctuation		With Average Regional Production Fluctuation	
	1961	1978	1961	1978		1961	1978	1971	1978
	million metric tons		-----percent-----			---------million metric tons---------			
Developed Countries	16.284	16.438	- .99	-1.06	.0506	0.719	0.771	0.816	0.882
Less-Developed Countries	17.653	40.583	- .77	- .80	.0542	0.606	1.448	0.737	1.760
Centrally-Planned Countries	9.762	21.629	-1.36	-1.72	.0711	0.592	1.659	0.944	2.645
World	43.699[c/]	78.649	-0.98	-1.11	.0446	1.917	3.878	2.496	5.287

a/ Developed countries excludes principal exporters (U.S., Canada, Australia and France). Less-developed countries excludes Argentina.

b/ The 1961 and 1978 normal imports are averages of the crop years 1960-62 and 1977-79, respectively.

c/ Excludes imports by "undesignated" countries.

d/ Obtained by regressing deviations from linear trends for imports on those for production. Elasticities computed using trend imports/production for 1961 and 1978. World elasticities are weighted sums of individual elasticites where regional import shares are weights. The 1961 world elasticity reflects an adjustment for excluded imports to "undesignated" countries. It is assumed that these are distributed across the three regions in proportion to their world shares.

e/ Coefficient of variation computed using average absolute deviation from linear trend.

f/ Computed for each region as total imports x import production elasticity x average annual variation in production. World totals assume that all regions simultaneously experience either below or above trend production.

FOOTNOTES

1/ These regional aggregates follow those used by the U.N. Food and Agriculture Organization. Where indicated, the regions exclude the five major wheat exporters: U.S., Canada, Australia, and France from the DCs, and Argentina from the LDCs. Data used were obtained from the USDA Oasis Data Bank. Consumption includes food, feed, and seed use. For countries where stock data are not available (e.g., China and USSR) consumption may include annual stock changes.

2/ Unless under free trade the insulating DC's maintain a significant margin of stocks above working levels, the primary adjustment would have to come through consumption.

3/ Behrman indicates that the medians of surveyed estimates of demand elasticities are -.2 for price and 0 for income.

4/ There are no significant negative correlations between production fluctuations in the three regions. This implies that they may all experience a shortfall (or surplus) of the magnitude indicated. The correlation is -.009 for DC/LDC, -.068 for LDC/CPC, and +.17 for DC/CPC fluctuations.

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