CHINESE DEMAND FOR AUSTRALIAN WHEAT: APPLICATION OF MARKET SHARE MODELS

Thomas Voon

School of Economics

Griffith University, Queensland

Abstract

Changes in the market shares of Australian wheat in the Chinese import market over the period 1960/61 - 1989/90 were analysed using three modelling procedures. The empirical results indicate that, in addition to relative price changes (P), retail availability index (R), which measures the total production in Australia relative to the average production in other wheat exporting countries, is important in determining market share changes. Market share is reported in all the models to be extremely price elastic both in the short and long run. Market share elasticity with respect to R is found to be inelastic in the short run but elastic in the long run.

CHINESE DEMAND FOR AUSTRALIAN WHEAT: APPLICATION OF MARKET SHARE MODELS

Introduction

Market share models are widely used to assess foreign demand for a country's traded commodities. The theory of using empirical market share analysis for agricultural commodities was first presented by Telser (1962) and later developed by Armington (1969). Telser presented the theoretical formulation for market share analysis and the demand for branded goods in domestic markets. Armington developed specifically a theory for products differentiated by location of production in world markets. Subsequently empirical models were used to apply the market share approach in international agricultural trade analysis. For instance, Sirhan and Johnson (1971) evaluated the export and import demand for the United States (US) cotton using a linear distributed-lag market share model. Both short-run and long-run price elasticities of US cotton share in selected import markets were measured, and these key parameters were used for analysing domestic trade and marketing policies. Reddy (1980) studied the Japanese demand for US and Australian coal using a log-linear market share model. Durham and Lee (1985) used several modelling techniques to examine the US market share of Middle Eastern poultry import markets. More recently Shalaby et al (1991) studied the US market share of Latin American wheat imports using a disaggregated (multi-country) analysis. This study has implications for the analysis of trade policies: for example market share elasticities were used as a guide in targeting US export subsidies for wheat.

Distributed-lag regression models are frequently used in the literature for formulating market share equations (e.g. Capel and Rigaux 1974; Tellis 1989). In those models, market share was commonly specified as a function of lagged share and one explanatory variable (i.e. relative prices). In this paper, we extend the previous analysis by incorporating two, rather than one, independent variables in the distributed-lag market share model. In our empirical study of Chinese demand for Australian wheat, we incorporate the retail availability variable in the model. According to economic theory, retail availability is deemed be important in determining market share. Therefore, the inclusion of this key variable could improve the predictive performance of the model (see Weiss 1968; Saghafi 1987).

In addition to extending the previous models by using a multivariate market share functions, a Multinomial Logit (MNL) market share model developed by Cooper and Nakanishi (1988) is used for our empirical analysis. The MNL model, in our view, has a distinct advantage over the conventional distributed-lag market share model. Unlike the single market share equation approach, the mathematical formulation necessarily guarantees that predicted market shares sum to unity and can never be negative, regardless of the values of the explanatory variables (see Tyrell and Mount 1982; Durham and Lee 1985). Besides, the market share elasticity computed from the model is theoretically meaningful (Thursby and Thursby 1984; Cooper and Nakanishi 1988).

In this paper, three empirical models encompassing the linear distributed-lag, the double log-linear distributed-lag and the semi-log MNL models are presented. The empirical results (market share elasticities) computed from the semi-log attraction-type MNL model will be compared with those estimated from the conventional distributed-lag market share models. The use of different models for comparing empirical results provides an understanding of the difference in results caused by model specification. This understanding would be helpful in interpreting the results.

The rest of this paper is organised as follows. In section 2, we provide a brief exposition of the Chinese wheat import market in general and the Chinese demand for

Australian wheat in particular. The major objective of this study is to show the application of market share analysis for a given commodity at a one country level. Research on wheat trade with specific importing countries has been neglected in favour of studies associated with the aggregation of the world wheat market (Shalaby et al 1991). The three market share models which may be used to study the Chinese demand for Australian wheat are presented in section 3. Section 4 discusses the system and variable specification and the data needed to apply the models. The empirical results are reported in section 5. The conclusion and policy implications arising from the study are reported in the final section of the paper.

The Chinese Wheat Import Market and The Demand for Foreign Wheat

China is one of the world's largest wheat producers and consumers. The domestic wheat production in China has increased from 18 metric tonnes (MT) in 1960/61 to 98 MT in 1989/90. Despite a large increase in the domestic production over that period, China imported an average of 7.5 MT of wheat for the same period. There are 5 major exporters of wheat to China, namely, the US, Canada, Australia, European Community (EC) and Argentina. Changes in relative market share of each of these 5 countries exporting wheat to China for the period 1960/61-1989/90 are shown in Appendix 1. The Australian market share of Chinese wheat imports averaged 29 per cent over the period under consideration. In absolute terms, Australia's share has declined considerably in recent years, from about 41.0% in 1978/79 to 11.8% in 1989/90. A reason for this decline, among others, is the emergence of new foreign agricultural trade policies (for example, the introduction of export subsidies by the US and EC).

Government intervention in agriculture is a common global phenomenon (Gardner 1987). A recent decision by the US to increase its wheat exports subsidies (partly to compete with EC's export subsidies) has become a concern for the Australian wheat exporters. An accelerated introduction of US and EC export subsidies is likely to raise the relative price ratio of Australian wheat to that of the rest of the world, thereby reducing Australia's market share of Chinese wheat imports notwithstanding Australia's comparative advantage in producing wheat. The way in which changes in relative price influence market share and trade performance of a country may be explained using market share elasticity values computed from an appropriate regression model. In addition, a knowledge of market share elasticities would provide an avenue for policy analysis.

Apart from changes in relative prices, two other important determinants of market share are retail availability and physical product characteristics (Weiss 1968; Chinese Commodity Inspection Bureau, per. com.). A periodic drought in the rest of the world (given a normal production condition in Australia), for instance, would raise the retail availability index (i.e. the total production in Australia relative to the average production in other wheat exporting countries). Economic theory postulates a positive relationship between retail availability index (R) and market share. A rise in the retail availability index would render an inadvertant increase in Australian market share, *ceteris paribus*. In the case of quality variable, a fall in protein content in Australian wheat of about 1 percentage point over the last 2 decades (see Voon and Edwards 1992) could also cause a reduced foreign demand for Australian wheat, *ceteris paribus*, provided that the characteristic 'protein' is valued by foreign (Chinese) consumers. There is also a strong theoretical basis for incorporating the quality variable in the regression models. However, due to the difficulty of obtaining reliable data on wheat quality characteristics across the five exporting countries, the quality variable is not incorporated in the empirical model.

There are two assumptions about consumer behaviour in China (the importing country) which are implicit in our market share equations. First it is assumed that the imported wheat classes are identifiable with the countries of origin and that these wheat classes are close but not perfect substitutes, so that an increase in price of Australia wheat will not result in its total disappearance from the Chinese import market. This assumption is based on the rationale that one class of wheat would normally possess some specific end-uses relative to other classes. Second, if the wheat price of an exporting country changes, the Chinese consumers will reduce their imports from that country gradually rather than instantaneously because it is uncertain to them whether or not the price change is permanent. Besides, supply of wheat in the exporting countries is likely to be inelastic in the short run (Hall and Menz 1985).

The Regression Models

I. The Linear Distributed-Lag Market Share Model

Market share (M) may be specified initially in terms of relative prices (i.e. the ratio of Australian price to the average of other prices):

$$M_{it} = f(P_{it}, R_{it}) \qquad (1)$$

where P_{it} is the ratio of exporter i's wheat price to all other exporters' prices and R_{it} is retail availability index. In linear algebraic form, equation (1) becomes:

$$M_{it} = a + bP_{it} + cR_{it} + u_{it}. \qquad (2)$$

where u_{it} is the random error term.

It is assumed that changes in market share do not respond instantaneously to changes in relative prices. Hence, the following adjustment equations are necessary in the process of constructing a distributed-lag regression model.

$$M^*_{it} = f(P_{it}, R_{it}) \quad (3)$$

$$M_{it} - M_{it-1} = \alpha(M^*_{it} - M_{it-1}) \quad (4)$$

where the asterisk superscript denotes the desired (long-run) value, and α represents the speed of adjustment parameter. Substituting equation (4) into equation (2) and expressing long-run market share as a function of the relative prices, we get:

$$M_{it} = \alpha a + \alpha b P_{it} + \alpha c R_{it} + (1-\alpha) M_{it-1} + \alpha u_{it} \quad (5)$$

Denoting $\beta_0=\alpha a$, $\beta_1=\alpha b$, $\beta_2=\alpha c$, $\beta_3=(1-\alpha)$ and $\mu_{it}=\alpha u_{it}$ (the stochastic error term), a linear distributed-lag market share function is derived:

$$M_{it} = \beta_0 + \beta_1 P_{it} + \beta_2 R_{it} + \beta_3 M_{it-1} + \mu_{it} \quad (6)$$

The parameters to be estimated are β_1, β_2 and β_3 (equation (6)). Once $(1-\alpha)$ is known, a, b and c can be computed. The coefficients αb and αc (equation (5)) represent the short-term response of market share to changes in price and retail availability, and b and c denote the long-run response of market share to changes in price and retail availability. The coefficients of equation (6) are statistically meaningful as long as the price variable and the lagged market share variable are independent of the error term in the regression equation. Otherwise, the existence of serial correlation in the disturbance will yield inconsistent estimates.

2. *The Log-linear Distributed Market Share Model*

The log-linear (double-log) version of equation (1) is assumed the form

$$\ln M_{it} = a_1 + b_1 \ln P_{it} + c_1 \ln R_{it} + \upsilon_{it} \tag{7}$$

The equivalent adjustment equations in logarithmic form are now expressed as:

$$\ln M_{it} - \ln M_{it-1} = \lambda(\ln M^*_{it} - \ln M_{it-1}) \tag{8}$$

Substituting equation (7) into equation (8) and performing the necessary simplification, we get a log-linear distributed-lag model of the form

$$\ln M_{it} = \lambda a_1 + \lambda b_1 \ln P_{it} + \lambda c_1 \ln R_{it} + (1-\lambda) \ln M_{it-1} + \lambda\upsilon_{it} \tag{9}$$

If we let $\gamma_0=\lambda a_1$, $\gamma_1=\lambda b_1$, $\gamma_2=\lambda c_1$, $\gamma_3=(1-\lambda)$, $\varepsilon_{it}=\lambda\upsilon_{it}$ and other terms are explained above, we have

$$\ln M_{it} = \gamma_0 + \gamma_1 \ln P_{it} + \gamma_2 \ln R_{it} + \gamma_3 \ln M_{it-1} + \varepsilon_{it} \tag{10}$$

where ε_{it} is the stochastic error term.

3. *The Multinomial Logit Market Share Model*

Market share equation (1) can be expressed as exponential functions of the form:

$$M_{it} = e^{f_{it}} / \sum_{j=1}^{m} e^{f_{jt}} \qquad (i, j = 1, 2 \ldots m) \tag{11}$$

where

$$f_i = a_2 + b_2 P_i + c_2 R_i + \omega_i$$

where f's denote linear function of the explanatory variables. By taking natural logarithm of both sides of equation (6), we obtain a semi-log market share function of the form

$$\ln(M_i) = a_2 + b_2P_i + c_2R_i + \omega_i - \sum_{j=1}^{m} (a_2 + b_2P_j + c_2R_j + \omega_j). \quad (12)$$

If we sum equation (12) over i (i = 1, 2......m) and divide by m, we have:

$$\ln(\tilde{M}_i) = \bar{a}_2 + b_2\bar{P} + c_2\bar{R} + \bar{\omega} - \sum_{j=1}^{m} (a_2 + b_2P_j + c_2R_j + \omega_j). \quad (13)$$

where $\tilde{M}_i = (\sum_{i=1}^{m} M_i)^{1/m}$ (the geometric mean of M_i); $\bar{P}$, $\bar{R}$ and $\bar{\omega}$ are the arithmetic means of P_i, R_i and ω_i respectively.

Subtract equation (13) from equation (12), we obtain

$$\ln(M_i/\tilde{M}_i) = (a_i - \bar{a}_2) + b_2(P_i - \bar{P}) + c_2(R_i - \bar{R}) + (\omega_i - \bar{\omega}). \quad (14)$$

Denoting $a_i^* = (a_i - \bar{a}_2)$, $P_i^* = (P_i - \bar{P}) + R_i^* = (R_i - \bar{R})$ and $\omega_i^* = (\omega_i - \bar{\omega})$, we have

$$\ln(M_i/\tilde{M}_i) = a_i^* + b_2P_i^* + c_2R_i^* + \omega_i^*. \quad 15)$$

The Data and Alternative Set of Regression

Our Ordinary Least Square regression uses annual observations covering the time span of 30 years (1960/61-1989/90). Data on wheat production, export quantities, and export prices were obtained from the World Wheat Statistics published by the International Wheat Council.

In the empirical regression analysis, two sets of regression were run for each of the three model specifications. Set one pertains to a 'sub-system' regression which encompasses only the market shares of the 5 major countries exporting wheat to China (the Chinese share is omitted from the regression analysis). The market shares of these 5 wheat exporting countries add up to unity. Set two, on the other hand, relates to a 'complete-system' regression which includes Chinese share as well as the other 5 exporters' share in the analysis. In this alternative set, the market shares of the 6 countries sum to unity. The rationale for running two sets of regression is as follows. The domestic Chinese wheat production has increased many fold over the last thirty years. This increase may be attributed to the domestic Chinese policy of achieving self-sufficiency in wheat by the year 2000 (ABARE 1992). It is possible that the persistent increase in domestic production of wheat in China over time could change the relative market shares of the 5 wheat exporting countries, *ceteris paribus*. An explanation for this is that if the Chinese wheat, on average, is closer in quality to one of the wheat exporters, then a rise in Chinese wheat production would reduce the market share of that exporting country as a result of a substitution in consumption. By running the two sets of regression, we can test the hypothesis that any persistent increase in domestic production would not alter the relative market shares of the 5 wheat exporting countries, *ceteris paribus*.

The data series was detected for non-stationarity prior to running the regressions. Using unit root testing procedure, our data series is shown to exhibit a stochastic trend which is referred to as difference stationary, or DS series, by Nelson and Plosser (1982). Researchers using traditional econometric testing procedures are likely to find spurious relationships among totally unrelated non-stationary series (Granger and Newbold 1974). In the following analysis any existence of non-stationarity in the data series is corrected by taking the first difference in each series.

Empirical Results and Implications

The statistical results computed from using three alternative forms of the Australian wheat market share equation (A, B and C) are tabulated in Table 1. It can be seen that all the coefficients have the proper sign, which is consistent with economic theory and *a priori* expectation. All coefficients of the price variable of the three equations are significantly different from zero at 1-5 per cent probability level. The lagged market shares are found to be important in determining current market share: the coefficients on lagged market share (equations A and B) are significant at 1-5 per cent level, suggesting the existence of a lag in share adjustment to relative price changes. The coefficients on R for equations A and C (but not equation B) are significant at 5-10 per cent level.

The computed R^2 values are comparable to those reported in previous market share analysis (e.g. Shalaby et al 1991). They are expected to improve if our limited data range can be expanded. The Durbin-Watson (DW) statistics in the three equations indicate that we cannot reject the null hypothesis of zero serial correlation at the 5% significance level. The empirical results tabulated in Table 1 were computed from the sub-system (5 country) equations. Re-estimation of these equations using a complete-system procedure did not improve the statistical quality of the results.

Table 2 presents the estimated elasticities of market share with respect to price (η_p), retail availability (η_r), as well as the coefficients of adjustment corresponding to equations A and B of Table 1. The short-run and long-run η_p were computed on the basis of the estimated coefficients (equations A and B). As expected, the long-run price elasticities are greater in absolute value than those of the short run. (Note that the long-run elasticity estimates corresponding to equations A and B are plausible since the coefficients of lagged market share are statistically significant.) Short-run η_p ranges from -3.6 to -5.5, while the long-run one ranges from -5.6 to -9.9. It is of interest that the η_p value obtained from equation C is fairly close to the long-run elasticity value obtained from equation A, which included the influence of lagged market share. The adjustment coefficients corresponding to equations A and B are consistent with the findings of researchers using distributed-lag models. In the case of market share elasticity with respect to R, the value of η_r is reported to be about 0.7 in the short run and about 1.1 in the long run (using equation A). The level of significance of the coefficients on R is weaker than that on P in all our three models.

According to the average long-run reported η_p value of -6.7, a 1% increase in the relative price ratio of Australian wheat to that of competitors will lead to a reduction in the Australian wheat market share by 6.7%. On the basis of such relatively large computed elasticities of market share with respect to prices, one may conclude that there is a high degree of competition in wheat imported by the Chinese from Australia and other sources. An implication for this is that if a competitor lowers the price of wheat imported by China (directly or indirectly via a subsidy), Australia would be obliged do the same rather than face a loss of market share. Hence, it appears that pricing policy may not be appropriate in increasing market share under a competitive environment. An alternative policy option to maintaining competitiveness and market share would be to improve the quality characteristics of Australian wheat via research or improved management practices (see Voon and Edwards 1992).

Our empirical results reveal that the MNL procedure (equation C) is not unequivocally superior to more traditional approaches (e.g. using equations A and B) to market share analysis. While the results do not offer compelling evidence that the MNL model is 'better', this application merely suggests that the model is at least as good empirically and certainly more desirable from the theoretical viewpoint.

Concluding Comments

The main contribution of this study is the demonstrated use of the MNL and the multivariate distributed-lag models for deriving market share elasticities for wheat using a country-specific example. The use of a multivariate framework, in contrast to the single variable market share models used in previous analysis, may increase the predictive property of the model since the two independent variables included in the regressions are theoretically plausible (see Madalla 1977). The use of different model forms, including the MNL equation, is helpful because the empirical results computed from those models can be compared so that a more robust outcome may be derived. The market share elasticity values computed from the regression models can be used as a guide for agricultural trade policy analysis.

In this paper, a limitation in interpreting the empirical results, in addition to the common data problem experienced in this type of analysis, stems from the inappropriateness to compare the relative validity of the models. For example, we cannot be sure that one model is 'better' than the other by judging either the R^2 value or the statistical significance of the coefficients since a comparison of these values between models provides no firm basis in statistical inference. It is suggested that the three different model forms used in our empirical analysis may be tested for statistical validity using an elaborate Box-Cox transformation method outlined by Jain and Vilcassim (1989). This consntutes an area for further research.

References

Australian Bureau of Agricultural and Resource Economics (1992), Effects of domestic chinese policies on world grain markets: Implications for Australia, Australian Government Publishing Service, Canberra.

Armington, P.S. (1969), 'A theory of demand for products distinguished by places of production', IMF Staff Papers, 16, 159-78.

Capel, R.E. and Rigaux, L.R. (1974), 'Analysis of export demand for Canadian wheat', Canadian Journal of Agricultural Economics, 22, 1-14.

Cooper L.G. and Nakanishi M. (1988), Market share analysis: evaluating competitive marketing effectiveness, Kluwer Academic, New York, USA.

Durham, S.E. and Lee, D.R. (1985), 'An evaluation of alternative approaches to market share analysis with application to the Kuwaiti poultry market', Journal of Agricultural Economics, 38, 85-97.

Gardner, B. (1987), The economics of agricultural policy, MacMillan, New York.

Granger, C.W.J. and Newbold, P. (1974), 'Spurious regressions in econometrics', Journal of Econometrics, 2, 111-20.

Hall, N.H. and Menz, K.M. (1985), 'Product supply elasticity for the Australian broadacre industries, estimated with a programming model.', Review of Marketing and Agricultural Economics, 53, 6-13.

Jain, D.C. and Vilcassim, N.J. (1989), 'Testing functional forms of market share models using the Box-Cox transformation and Lagrange multiplier approach', International Journal of Research in Marketing, 6, 95-107.

Madalla, G.S. (1977), Econometrics, Second Edition, McGraw-Hill, New York.

Nelson, C.R. and Plosser, C.I. (1982), 'Trends and random walks in macroeconomic time series', Journal of Monetary Economics, 10, 139-62.

Reddy, N.N. (1980), 'Japanese demand for US coal: a market share model', Quarterly Review of Economics and Business, 16, 51-60.

Saghafi, M.M. (1987), 'Market share stability and marketing policy: An axiomatic approach', Research in Marketing, 9, 267-84.

Shalaby, S., Yanagida, J.F. and Hassler, J.B. (1991), 'United States market share of Latin American wheat imports: disaggregated analysis and application of the Armington model', Journal of Economic Studies, 15, 5, 24-33.

Sirhan, G.A. and Johnson, P.R. (1971), 'A market share approach to the foreign demand for US cotton', American Journal of Agricultural Economics, 53, 593-99.

Tellis, G.J. (1989), 'Advertising exposure, loyalty, and brand purchase: a two-stage model of choice', Journal of Marketing Research 25, 134-44.

Telser, L.G. (1962), 'The demand for branded goods as estimated from consumer panel data', Review of Economics and Statistics, 66, 120-8.

Thursby, J. and Thursby, M. (1984), 'How reliable are simple single equation specifications of import demand?', Review of Economics and Statistics, 66, 120-8.

Tyrell, T. and Mount, T.D. (1982), 'A nonlinear expenditure system using a linear logit specification', American Journal of Agricultural Economics, 64, 539-46.

Voon, J.P. and Edwards, G.W. (1992), 'Research payoff from quality improvement: The case of protein in Australian wheat', American Journal of Agricultural Economics, 74, 564-72.

Weiss, D.L. (1968), 'Determinants of market share', Journal of Marketing Research, 5, 290-95.

Table 1. Australian Market Share in the Chinese Wheat Import Market: Statistical Results for Regression Models 1-3, 1960/61-1989/90.

Equation (A) A Linear Distributed-lag Model

$$M_{it} = -0.0504 - \underset{(-2.9216)^{*}}{1.1185P_{it}} + \underset{(2.3213)^{**}}{0.6185R_{it-1}} + \underset{(2.3537)^{**}}{0.3558M_{it-1}}$$

$R^2 = 0.453$ $DW = 2.164$ $SE = 0.1266$ $F = 6.896$

Equation (B) A Double-Log Linear Distributed-lag Model

$$\ln M_{it} = -0.1847 - \underset{(-3.5910)^{*}}{5.4640 \ln P_{it}} + \underset{(1.4717)^{****}}{0.6093 \ln R_{it-1}} + \underset{(2.9596)^{*}}{0.4457 \ln M_{it-1}}$$

$R^2 = 0.519$ $DW = 2.144$ $SE = 0.4851$ $F = 8.990$

Equation (C) A Multinomial Logit Model

$$\ln (M_i/\tilde{M}_j) = 0.4947 - \underset{(-1.8377)^{**}}{7.1875P^{*}_i} + \underset{(1.7975)^{***}}{0.0007R^{*}_i}$$

$R^2 = 0.442$ $DW = 2.119$ $SE = 0.5457$ $F = 9.1180$

Number in parentheses are computed t-values

* Significant at 1.0 per cent level or better

** Significant at 5.0 per cent level

*** Significant at 10.0 per cent level

**** Significant at 15.0 per cent level

Table 2. Estimates of Market Share Elasticities of Australia's share in the Chinese Import Market, 1960/61-1989/90.

Equation	η_{sr}	η_{lr}	η_{sp}	η_{lp}	α
A	0.801	1.243	-3.604	-5.586	0.644
B	0.609	1.099	-5.464	-9.857	0.554
C	NA	5.049	NA	-4.888	NA

η_{sr} denotes short-run market share elasticity with respect to retail availability

η_{lr} denotes long-run market share elasticity with respect to retail availability

η_{sp} denotes short-run market share elasticity with respect to relative prices

η_{lp} denotes short-run market share elasticity with respect to relative prices

α denotes the rate of adjustment

NA denotes 'not applicable'

APPENDIX 1

Chinese Wheat Imports (Metric Tonne)

YR	ARG	AUS	CAN	EEC	USA	TOT
1961	88	1953	1968	200	0	4209
1962	98	2059	1678	990	0	4825
1963	988	2543	1005	222	0	4758
1964	599	2253	1758	339	0	4949
1965	2241	2017	2053	61	0	6372
1966	306	2163	2465	73	0	5007
1967	0	2416	1367	363	0	4156
1968	0	1182	2127	254	0	3563
1969	0	2446	1830	764	0	5040
1970	0	1310	2346	4	0	3660
1971	0	817	2967	0	0	3784
1972	0	324	4374	0	591	5289
1973	0	1239	1367	26	3190	5822
1974	210	1244	2366	180	1496	5496
1975	0	1126	1204	0	0	2330
1976	477	750	1929	0	0	3156
1977	373	4603	3321	0	225	8522
1978	885	1382	3181	0	2610	8058
1979	465	3575	2621	90	1929	8680
1980	200	1397	2911	607	8662	13777
1981	199	1413	2991	116	8054	12773
1982	1956	1170	4242	1410	4186	12964
1983	1010	1660	3848	137	3131	9786
1984	675	1426	2792	82	2455	7430
1985	589	2704	2644	304	581	6822
1986	872	3267	3619	807	141	8706
1987	300	2170	7807	62	4496	14835
1988	943	1521	3540	1578	7586	15168
1989	856	1030	4257	0	5556	11699
1990	NA	1485	NA	NA	NA	12530

NA - data not available.

Market Shares - Subsystem

YR	ARG	AUS	CAN	EEC	USA
1961	0.021	0.464006	0.467569	0.047517	0
1962	0.02	0.426736	0.347772	0.205181	0
1963	0.208	0.534468	0.211223	0.046658	0
1964	0.121	0.455243	0.355223	0.068499	0
1965	0.352	0.316541	0.322191	0.009573	0
1966	0.061	0.431995	0.492311	0.01458	0
1967	0.002	0.581328	0.328922	0.087344	0
1968	0	0.331743	0.596969	0.071288	0
1969	0	0.485317	0.363095	0.151587	0
1970	0	0.357923	0.640984	0.001093	0
1971	0	0.215909	0.784091	0	0
1972	0	0.061259	0.826999	0	0.111741
1973	0	0.212813	0.234799	0.004466	0.547922
1974	0.038	0.226346	0.430495	0.032751	0.272198
1975	0	0.483262	0.516738	0	0
1976	0.151	0.237643	0.611217	0	0
1977	0.044	0.540131	0.389697	0	0.026402
1978	0.11	0.171507	0.394763	0	0.323902
1979	0.054	0.411866	0.301959	0.010369	0.222235
1980	0.015	0.101401	0.211294	0.044059	0.628729
1981	0.016	0.110624	0.234166	0.009082	0.630549
1982	0.151	0.09025	0.327214	0.108763	0.322894
1983	0.103	0.16963	0.393215	0.014	0.319947
1984	0.091	0.191925	0.375774	0.011036	0.330417
1985	0.086	0.396365	0.38757	0.044562	0.085166
1986	0.1	0.375258	0.41569	0.092695	0.016196
1987	0.02	0.146276	0.526255	0.004179	0.303067
1988	0.062	0.100277	0.233386	0.104035	0.500132
1989	0.073	0.088042	0.363877	0	0.474912
1990	NA	0.118516	NA	NA	NA

NA - data not available.

Chinese Wheat Imports and Domestic Production (Metric Tonne)

YR	ARG	AUS	CAN	EEC	USA	CHN	TOT
1961	88	1953	1968	200	0	18000	22209
1962	98	2059	1678	990	0	20000	24825
1963	988	2543	1005	222	0	22000	26758
1964	599	2253	1758	339	0	25000	29949
1965	2241	2017	2053	61	0	26000	32372
1966	306	2163	2465	73	0	26000	31007
1967	10	2416	1367	363	0	28000	32156
1968	0	1182	2127	254	0	27000	30563
1969	0	2446	1830	764	0	29000	34040
1970	0	1310	2346	4	0	31000	34660
1971	0	817*	2967	0	0	33000	36784
1972	0	324	4374	0	591	35985	41274
1973	0	1239	1367	26	3190	35225	41047
1974	210	1244	2366	180	1496	40865	46361
1975	0	1126	1204	0	0	45310	47640
1976	477	750	1929	0	0	50385	53541
1977	373	4603	3321	0	225	41075	49597
1978	885	1382	3181	0	2610	53840	61898
1979	465	3575	2621	90	1929	62730	71410
1980	200	1397	2911	607	8662	55210	68987
1981	199	1413	2991	116	8054	59640	72413
1982	1956	1170	4242	1410	4186	68420	81384
1983	1010	1660	3848	137	3131	81390	91176
1984	675	1426	2792	82	2455	87820	95250
1985	589	2704	2644	304	581	85810	92632
1986	872	3267	3619	807	141	90295	99001
1987	300	2170	7807	62	4496	85840	100675
1988	943	1521	3540	1578	7586	85432	100600
1989	856	1030	4257	1032	5556	90807	103538
1990	NA	1485	NA	NA	NA	98229	110759

NA - data not available.

Market Shares - Complete system

YR	ARG	AUS	CAN	EEC	USA	CHN
1961	0.0039	0.0879	0.0887	0.009	0	0.8105
1962	0.0039	0.0829	0.0675	0.0398	0	0.8059
1963	0.0369	0.095	0.0376	0.0083	0	0.8222
1964	0.02	0.0752	0.0587	0.0114	0	0.8347
1965	0.0694	0.0623	0.0634	0.0019	0	0.803
1966	0.0099	0.0697	0.0795	0.0024	0	0.8385
1967	0.0003	0.0751	0.0425	0.0112	0	0.8708
1968	0	0.0387	0.0696	0.0083	0	0.8834
1969	0	0.0719	0.0538	0.0224	0	0.8519
1970	0	0.0378	0.0677	0.0001	0	0.8944
1971	0	0.0223	0.0807	0	0	0.897
1972	0	0.0078	0.1059	0	0.014	0.872
1973	0	0.0302	0.0333	0.0006	0.078	0.8582
1974	0.0046	0.0269	0.051	0.0039	0.032	0.8815
1975	0	0.0237	0.0253	0	0	0.951
1976	0.0089	0.014	0.036	0	0	0.9411
1977	0.0075	0.0928	0.067	0	0.005	0.8282
1978	0.0143	0.0223	0.0514	0	0.042	0.8698
1979	0.0065	0.05	0.0368	0.0013	0.027	0.8784
1980	0.0029	0.0203	0.0422	0.0088	0.126	0.8002
1981	0.0028	0.0195	0.0413	0.0016	0.111	0.8236
1982	0.0241	0.0144	0.052	0.0173	0.052	0.8407
1983	0.0111	0.0182	0.0422	0.0015	0.034	0.8927
1984	0.0071	0.0149	0.0293	0.0009	0.026	0.922
1985	0.0064	0.0292	0.0285	0.0033	0.006	0.9263
1986	0.0088	0.033	0.0366	0.0082	0.001	0.912
1987	0.0031	0.0216	0.0775	0.0006	0.045	0.8526
1988	0.0094	0.0151	0.0352	0.0157	0.075	0.8492
1989	0.0083	0.0099	0.0411	0.01	0.054	0.877
1990	NA	0.0134	NA	NA		0.8869

NA - data not available.

Price of wheat ($US/tonne)

YR	AUS	ARG	CAN	EEC	USA	CHN
1961	61	61	72	0	63	113.4
1962	59	61	72	0	64	113.4
1963	62	66	74	0	66	112.1
1964	58	58	72	0	64	112.1
1965	59	55	73	0	60	113
1966	63	59	77	0	67	129.9
1967	58	62	71	0	62	129.9
1968	58	58	71	0	63	215.9
1969	54	56	67	0	53	215.9
1970	58	57	71	0	60	215.9
1971	58	62	69	106	60	215.9
1972	91	86	97	185	91	215.9
1973	195	70*	207	168	177	215.9
1974	167	163	206	139	164	215.9
1975	147	144	183	0	152	215.9
1976	113	104	139	97	113	215.9
1977	119	116	133	133	116	215.9
1978	142	132	158	171	141	215.9
1979	169	192	198	170	174	215.9
1980	181	204	223	150	182	157.8
1981	165	178	196	132	171	158
1982	164	148	185	146	159	158
1983	154	137	190	131	154	158
1984	150	125	177	111	148	158
1985	133	102	182	83	128	158.2
1986	110	84	138	84	110	164.8
1987	125	101	145	147	124	170.6
1988	172	151	209	142	167	196.6
1989	168	139	188	90	162	239.6
1990	127	87	137	118	118	220

Production of wheat (Metric Tonne)

YR	CHN	ARG	CAN	EEC	USA	AUS
1961	18000	5100	7713	28287	33604	6727
1962	20000	5020	15392	36458	29765	8353
1963	22000	8940	19689	29818	31080	8924
1964	25000	11240	16341	35837	35126	10037
1965	26000	6079	17661	30486	35805	7067
1966	26000	6247	22516	26526	35699	12699
1967	28000	7320	16137	31333	41433	7547
1968	27000	5740	17686	32418	42899	14804
1969	29000	7020	18267	37217	39263	10546
1970	31000	4920	9024	36557	36783	7890
1971	33000	5440	14412	41988	44053	8511
1972	35985	7900	14515	43282	42081	6434
1973	35225	6560	16162	43081	46560	11987
1974	40865	5970	13304	47501	48496	11357
1975	45310	8570	17081	40039	57886	11982
1976	50385	11000	23587	41466	58481	11800
1977	41075	5300	19862	40125	55671	9370
1978	53840	8100	21145	50304	48322	18090
1979	62730	8100	17184	48226	58080	16188
1980	55210	7780	19158	55089	64799	10856
1981	59640	8100	24802	54377	75795	16360
1982	68420	15130	26737	59898	75250	8876
1983	81390	13000	26505	64011	65856	22016
1984	87820	13000	21199	82612	70618	18666
1985	85810	8700	24252	71248	65973	15999
1986	90295	8952	31378	72013	56895	16119
1987	85840	8800	25992	71578	57361	12369
1988	85432	8400	15996	74772	49320	14054
1989	90807	10302	24575	79185	55428	14214
1990	98229	11350	32709	84398	74543	15068