Export Growth of U.S. Peanuts

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Ⅰ、Introduction

Based on U.N. trade data, U.S. peanut exports rose from 29, 600 metric tons in calendar year 1969 to 402,200 metric tons in calendar year 1979. However, in calendar year 1987, U.S. peanut exports dropped to 245,700 metric tons. These fluctuations in U.S. peanut exports, referred to as export growth, are hypothesized in this study to be the result of changes in shifters of supply and demand. Export growth in this study is defined as a change in the amount of goods exported from one (focus) country to another (target) country, in a specific time period. Based on this definition, export growth can be either positive or negative. This study seeks to explain U. S. export growth in peanuts as a function of basic supply-demand shifts that affect market shares.

Ⅱ、Constant Market Shares

The concept of constant market shares (CMS) is based upon the hypothesis that market shares will remain constant for all exporters, hence no export growth, unless some event(s) occurs to alter the exporter's "competitiveness". The model is used to decompose the amount of an exporter's growth (either positive or negative) into three separate effects for a commodity. These effects are: (1) a market size

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effect; (2) a distribution effect; and (3) a competitive effect. Each individual effect denotes different reasons for changes in export growth.

The CMS method has been applied to the international wheat market for Canada and Australia by Rigaux (1971) and Sprott (1972), respectively. Rigaux's objective was to determine reasons for the reduction in Canadian wheat sale from 1963-64 to 1967-68. The results of the study indicate that because the majority of the losses were considered to be distributive and not competitive, the losses would likely be attributed to policies enacted by importers, not marketing procedures imposed by the Canadian Wheat Board.

Sprott used the same basic approach for Australian wheat for the periods 1954-55 and 1966-67 to 1969-70. His findings suggest, an increase in Australian wheat sales was due to an increase in the demand for wheat and appropriate marketing technigues used by Australia. These gains were based upon the market size and the competitive effect.

Ames (1982) and Schaub (1987) applied CMS to determine export growth for U.S. peanuts. Ames results indicate that gains in export growth for U.S. peanuts during the years 1970-1977 were attributed primarily to the competitive effect, which made up approximately 95 percent of the relative changes in exports.

Schaub used a similar approach to determine changes in export growth for peanuts for the years 1978 to 1985. His findings show, based on USDA trade data, that U.S. peanut exports peeked in 1978 (466,000 MT), but fell dramatically in 1981 (208,000 MT). Peanut shipments to each export market declined in 1981. Market share analysis determined all three effects acted to reduce U.S. peanuts exports, however, the competitive effect accounted 77 percent of the total loss.

The technique for computing each individual CMS effect was employed by Schaub in his market share analysis of U.S. peanut exports. Schaub used an algebraic method to compute the effects from first differences of observed data.

The analysis of this study is based upon this approach used by Schaub, where;

$$\text{The market size effect} = [(K_{.1}) * \sum_{i=1}^{N} W_{i2}] - \sum_{i=1}^{N} U_{i1}$$

$$\text{The distribution effect} = (\sum_{i=1}^{N} K_{i1} - K_{.1}) * (\sum_{i=1}^{N} W_{i2})$$

$$\text{The competitive effect} = \sum_{i=1}^{N} U_{i2} - (\sum_{i=1}^{N} K_{i1} * \sum_{i=1}^{N} W_{i2})$$

W_{ij} = imports to market i in period j;

U_{ij} = U.S. exports to market i in period j;

$$K_{ij} = \frac{U_{ij}}{W_{ij}} = \text{U.S. market share of imports to market i in period j;}$$

$$K_{.j} = \frac{\sum_{i=1}^{N} U_{ij}}{\sum_{i=1}^{N} W_{ij}} = \text{U.S. share of all imports in period j;}$$

In this study, however, the model is expanded and applied to each country that is a competitor of the U.S. in the peanut export market. Applying the model to each country is possible because a unique data base was constructed that identifies for the first time the flow of peanut trade among all countries.

Ⅲ、Data Used in the Study

The data set used in this analysis consists of a collection of UN trade statistics which were later edited by the USDA, ERS. The USDA edits UN trade statistics to provide more complete and accurate data sets to the public. This is because often times reported import levels do not equal reported export levels, therefore

the USDA feels the need to reconcile trade data inconsistencies.

The reconciliation takes place in two forms. First, export trade was replaced by import trade, when possible. This adjustment was made because import data is generally considered to be more accurate than export data is generally considered to be more accurate than export data. Second, trade observations from cetrally planned and developing countries which do not normally report statistics to the U. N. were added.

U.N. trade statistics are reported on a calendar year basis, which begins in January and end in December of a given year. Other agencies involved in trade data, such as the Foreign Agricultural Service branch of the USDA, report statistics in marketing years. Marketing years vary with different commodities, in this case a marketing year begins in August of a given year and continues through July of the following year.

Because of the dissimilar time frames involved in reporting trade statistics, problems can arise when comparing U.N. trade data from another source, such as U.S. trade data. Therefore, it is advisable to be familiar with the origin of the data when making comparisons.

Ⅳ、Results of the Export Growth Models

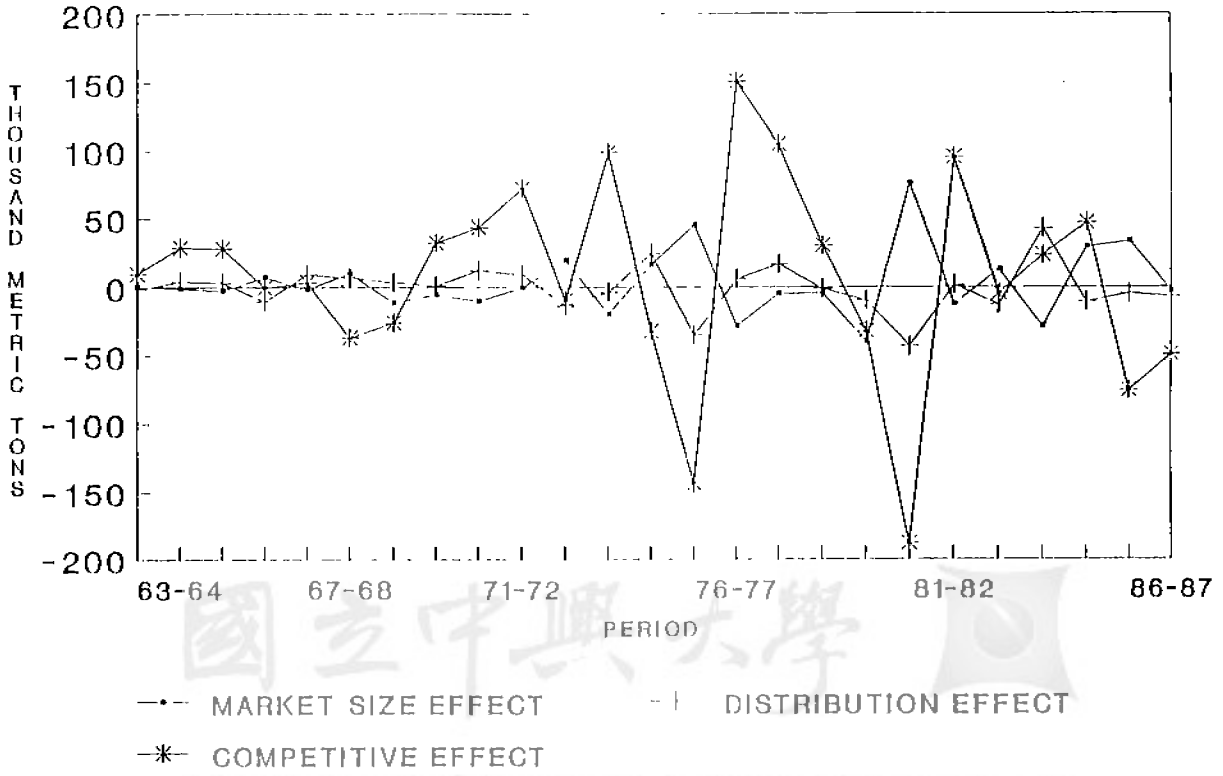
The CMS effects for the U.S. as a focus country were calculated based on year to year changes from 1962 to 1987 and resulted in 25 observations (figure 1.). CMS effects were similarly calculated for principal U.S. competitors.

Econometric models were developed to help determine some of the factors that influence changes in export growth. A market size effect model, a distribution effect model and a competitive effect model were computed for the U.S.

Principal markets for U.S. peanuts were Belgium, Canada, France, West Germany, Italy, Japan, the Netherlands, Portugal, Switzerland, and the United Kingdom.

Other peanut exporter competitors were Argentina, Brazil, China (PRC),

FIGURE 1 EXPORT GROWTH FOR U.S. PEANUTS



Gambia, India, Niger, Nigeria, Senegal, South Africa, and Sudan.

Trade data were obtained from the UN data base, edited by the USDA. Financial and economic statistics used in the study were obtained from International Financial Statistics, published by the International Monetary Foundation.

V、The U.S. Market Size Effect Model

The market size effect was hypothesized to be the result from a shift in the global demand of a good was developed. The model selected for the U.S. market size effect was formulated as the U.S. market size effect is a function of major demand shifters. These shifters were considered to be the real purchasing power of the U.S. dollar in the major peanut importers, and the real per capita income in the major peanut importers.

The U.S. market size effect model is formulated as

US3= f (TWRERI, TWRPCII).

The dependent variable, US3, denotes the U.S. market size effect with respect to the major peanut importers for period j. Period j consists of years t to t+1 and j= 1..25.

The explanatory variables are as follows:

TWRERI is the real value of the U.S. dollar in year t, with respect to the currencies of the major peanut importers, in the form of a real exchange rate index, trade weighted based upon the volume of peanuts received from the U.S. by the major peanut importers. The year 1973 was selected as the base for the exchange rates.$TWRERI_t$ is determined by calculating $\Sigma TW_{it} * \frac{(ER_{it} / ER_{i73})}{(CPI_{it} / 100)}$. TW_{it} is the percent volume of peanuts received by importer i from the U.S., in year t, and Σ TW_{it} equals 100 percent in year t (i= 1..10, t= 1..26). ER_{it} is the nominal currency exchange rate, in U.S. dollars, of importer i, in year t (i= 1..10, t= 1..26). ER_{i73} is the nominal currency exchange rate, in U.S. dollars of importer i, in 1973 (effect; (2) i= 10). CPI_{it} is the consumer price index of importer i, year t, 1985

= 100 (i= 1..10, t= 1..26).

TWRPCII is the real per capita income in year t, for the major peanut importers represented by a trade weighted index, based upon the volume of peanuts received from the U.S., by the major peanut importers. The year 1973 was selected as the base (i= 1..10, t= 1..26). $TWRPCI_t$ is calculated by $\sum TW_{it} * \frac{(PCI_{it}/PCI_{i73})}{CPI_{it}/100}$. TW_{it} is the percent volume of peanuts received by importer i from the U.S., in year t, $\sum TW_{it}$ equals 100 percent in year t (i= 1..10). PCI_{it} is the per capita income of importer i, in year t. PCI_{it} is determined by dividing GNP_{it}/POP_{it} (i = 1..10, t= 1..26). GNP_{it} is the Gross National Product of importer i, in year t (i= 1..10, t= 1..26). POP_{it} is the population of importer i, in year t (i= 1..10, t = 1..26). PCI_{i73} is the per capita income of importer i, in 1973. PCI_{i73} is determined by dividing GNP_{i73}/POP_{i73} (i= 1..10). CPI_{it} is the Consumer Price Index of importer i, in year t, 1985= 100, (i= 1..10, t= 1..26). The results of the analysis for the U.S. market size effect model are found in table 1.

The sign of the trade weighted real exchange rate index (TWRERI) for the U.S. market size effect model was negative, as expected. The t-value in this case was also significant at the α = .05 level. The parameter estimate of -51.22 indicates that for every one unit increase in the TWRERI, the U.S. market size effect would decrease by 51.22 thousand metric tons, ceteris paribus.

The sign of the trade weighted real per capita income index (TWRPCII) was positive, as expected. The t-value was also significant at the α = .05 level.

The parameter estimate of 54.59 implies for every one unit increase in the TWRPCII, the U.S. market size effect would increase by 54.59 thousand metric tons.

Ⅵ、The U.S. Distribution Effect Model

The distribution effect was hypothesized to be driven by simultaneous shifts in supply among the major exporters and the resulting abillity of the focus country to trade in markets where demand is expanding. The model for the U.S. distribution effect is formulated as the U.S. distribution effect with respect to the major peanut importers is a function of the sum of the other major peanut exporters distribution effect, the value of the U.S. dollar as a demand shifter int he major peanut importers countries.

The model for the distribution effect is formulated as

US4= f(IMP10, TWRERI).

The dependent variable, US4, denotes the U.S. distribution effect with respect to the major peanut importers in period j. Period j consists of years t to t_{+1} and j= 1...25.

The explanatory variables used were IMP10 and TWRERI. IMP10 is the sum of the other peanut exporters' distribution effect, with respect to the major peanut importers in period j. Period j consists of years t to t_{+1} and j= 1...25.

The sum of the distribution effect for other peanut exporters was used as an independent variable in the U.S. distribution effect model to determine if any relationship exists between the U.S. distribution effect and the distribution effect of other peanut exporters. This is based on the hypothesis that related changes which occur in both supply and demand factors in the focus and target countries have an impact on each other. Therefore, the sign of the U.S. distribution effect and the sign of the distribution effect for the other exporters are expected to be opposite.

TWRERI, the trade weighted real exchange rate index, was also used in the U.S. distribution effect model as a shifter of demand. The procedure used to develop the trade weighted exchange rate is the same as the one used in the model for the market size effect. As the U.S. dollar weakens, the distribution effect for the U.S. is predicted to increase. Therefore, a negative sign is expected.

The results of the U.S. distribution effect model are found in table 2. The sign for the other major peanut exporters distribution effect (IMP10), with respect to the major peanut importers was negative, as expected. The t-value was also significant at the $\alpha = .01$ level. The parameter estimate of -0.81 indicates, as the distribution effect of the other peanut exporters decreases by 1000 metric tons, the U. S. distribution effect increases by 810 metric tons, ceteris paribus.

The sign for the trade weighted real exchange rate index (TWRERI) was negative as expected. An inverse relationship should exist between the U.S. distribution effect and the value of the U.S. dollar in the major peanut importers. The t-value for TWRERI was significant at the $\alpha = .01$ level. The parameter estimate of -10.44 indicates that an increase in the TWRERI of one unit, would result in a decrease in U.S. distribution effect of 10.44 thousand metric tons.

In the U.S. distribution effect model, the value of the U.S. dollar proved to be a significant shifter of demand in individual markets, however, the impact of the value of the U.S. dollar, as represented by the TWRERI, was not as great as the impact of the value of the U.S. dollar in the U.S. market size effect model. A one unit increase in the TWRERI denoted an approximate 10,000 metric ton decrease in the U.S. distribution effect.

The inverse relationship between the trade weighted real exchange rate index (TWRERI) and the U.S. distribution effect also denotes that a weak U.S. dollar encourages trade with the U.S., and a strong U.S. dollar discourages trade with the U.S.

Ⅶ、The U.S. Competitive Effect Model

The competitive effect was theorized to measure changes in an exporters ability to effectively market it's product at declining price levels in an importing country. Changes in export growth, attributed to changes in the competitive effect, result in an increase or a decrease of the exporting or focus countries market shares. The competitive effect was hypothesized in this study to be supply driven in

the focus country or one of the focus country's competitors. If the focus country is successful in marketing its product at prevailing prices, then other exporters will show adverse competitive effects, even though their supply conditions could be enlarged.

The model for the competitive effect was formulated as the U.S. competitive effect is a function of the sum of the other peanut exporters competitive effects, changes in U.S. tehnology and the first difference in would peanut price. The model for the competitive effect is formulated as

US5= f(IMP11, DIFF).

The dependent variable, US5, is the U.S. competitive effect, with respect to the major peanut importers for period j. Period j consists of years t to t+1 and j= 1...25.

The explanatory variable were IMP11, US2 and DIFF. IMP11 is the sum of other peanut exporters' competitive effects, with respect to the major peanut importers in period j. Period j consists of years t to t+1 and j= 1...25.

US2 is the average pound per acre U.S. peanut yield in year t, used as a proxy for changes in U.S. technology (t= 1..26).

DIFF is equal to WP_{t+1}— WP_t, WP_t is the world price of peanuts in year t and WP_{t+1} is the world price of peanuts in following year, t+1.

The sum of the competitive effects for other peanut exporters was chosen as an independent variable to determine if a relationship exist between changes in the U.S. competitive effect and changes in the competitive effect for other peanut exporters. Based on the hypothesis that a change in market shares results from the competitive effect, a negative relationship is expected between the U.S. competitive effect and the competitive effect for the other peanut exporters.

The first difference of world price for peanuts was chosen as an independent variable to determine if any relationship exists between the world price of peanuts in the previous period and in the U.S. competitive effect. An increase in an exporter's market shares must result for a successful competitor to gain from a decrease in price, therefore a negative sign is expected.

peanut prices for each major importer were determined by taking a yearly average of the price for all peanuts received by importers. These peanut prices are converted to U.S. dollar values by the reporting country or by the U.N., and summed together.

The results of the competitive effect model are found in table 3. The sign for the sum of other major peanut exporters competitive effect (IMP11) was negative as expected. The t-value in this case was also significant at the $\alpha = .01$ level. This indicates an inverse relationship between the competitive effect for the other major peanut exporters and the U.S. competitive effect. The parameter exporters and the U.S. competitive effect. The parameter estimate of -0.80 indicates as the competitive effect of the other exporters decreases by 1000 metric tons, an increase of 800 metric tons in the U.S. competitive effect would result.

The negative sign of the difference for world peanuts price in year t_{+1} and year t, was expected. When the difference in world price decreases, the export growth attributed to the competitive effect should increase. The t-value wsa significant at the $\alpha = .10$ level. The parameter estimate of -0.08 indicates when the first difference in world price decreases by one dollar per metric ton, the U.S. competitive effect increases by 80 metric tons.

Ther inverse relationship between the U.S. competitive effect that when the U.S. increases (decreases) its market share position of an importer, market share positions for one or more of the other peanut exporters would decrease (increase), assuming all else remains equal. Acquiring a competitive advantage in the world peanut market through lower prices would allow the U.S. to capture market share positions of major peanut importers, once held by other peanut exporters.

Ⅷ、Summary

Flexible exchange rates have been portrayed as the single most important variable in determining agricultural trade (Shane). This study appears to refute that hypothesis in the case of peanuts. The computed CMS effects (figure 1) clearly

showed that the competitive effect dominated the market size and the distribution effects which are significantly affected by exchange rates.

Competitive effects, whose source is the supply side of the market, are the basis of the most change in export growth of peanuts. However, this study was not successful in discovering the source of U.S.supply shifters. An hypothesis for future study is that agricultural policy is the primary shifter. If this is true, the applicable policy changes need to be identified. Knowledge of these policies could be important in maintaining the U.S. position as the worlds principal exporter of peanuts.

Table 1. Results of the U.S. Market Size Effect Model

Variable	US3
Intercept	75.19 (1.42)a/
TWRERI	−51.22 (−2.06)**
TWRPCII	54.59 (2.24)**
R-square	0.4313
DW d statistic	2.262

a/ t-values in parentheses

*** α significant .01

** α significant .05

* α singificant .10

Table 2. Results of the U.S. Distribution Effect Model

Variable	US4
Intercept	46.82
	(2.19)a/
IMP10	−0.81
	(−5.99)***
TWRERI	−10.44
	(−4.69)**
R-square	0.8693
DW d statistic	1.799

a/ t-valucs in parentheses

*** α significant .01

** α significant .05

* α singificant .10

Table 3. Results of the U.S. Competitive Effect Model

Variable	US5
Intercept	−6.34 (−0.22)a/
IMP11	−0.80 (−9.87)***
DIFF	−0.08 (−1.85)*
R-square	0.8518
DW d statistic	2.504

a/ t-values in parentheses

*** α significant .01

** α significant .05

* α singificant .10

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美國花生外銷成長之研究

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摘 要

本文旨在應用空間均衡模型來探討美國花生自1969年至1987年外銷成長之原由，假設此外銷成長是基本供需移動之函數，此等移動進而影響市場佔有率。

由實證結果，顯示浮動匯率非爲影響美國花生外銷之重要因素，反而是外來競爭因素左右花生市場之大小和分配效果；申言之，屬供給面的競爭結果仍是促使美國花生外銷市場變化之首要因素。另本文雖未成功地證實供給面的另外因素，卻可預期地指出農業政策似是未來影響花生外銷所不可忽視之因素。

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