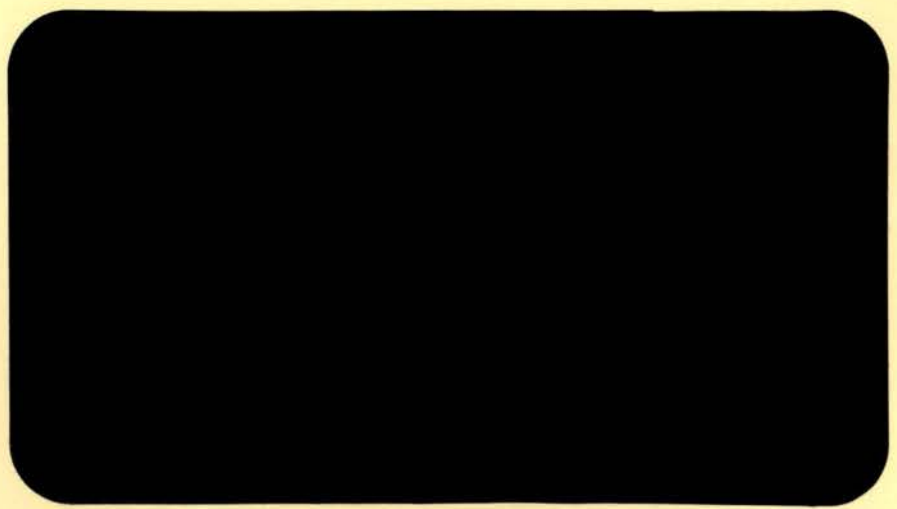


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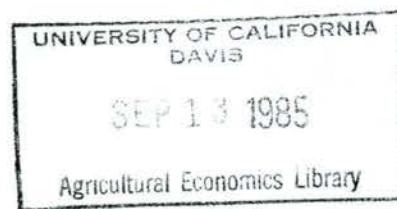
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REVIEW OF THE LITERATURE

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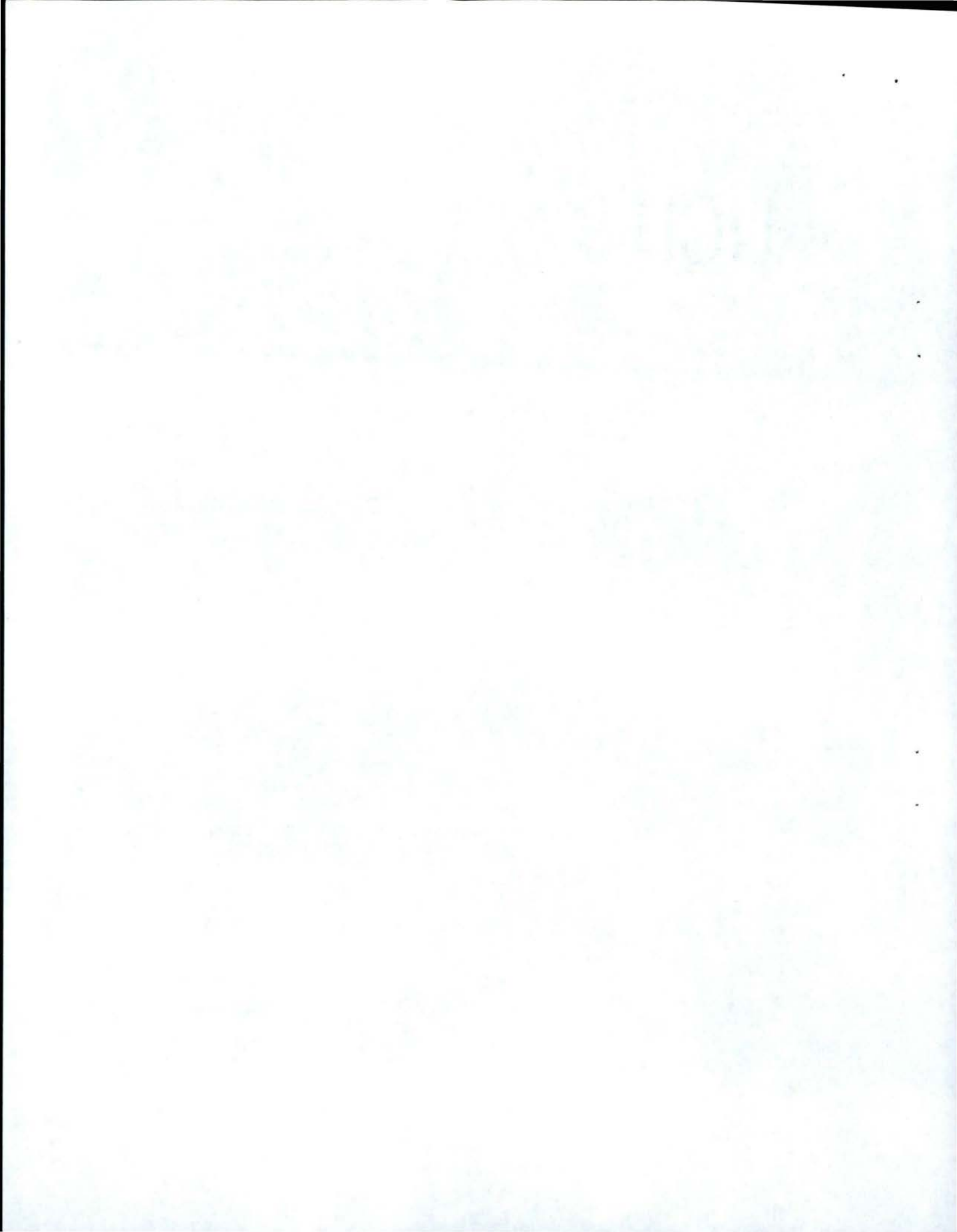
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## Introduction

The vast majority of the literature of agricultural economics is based on microeconomic foundations and addresses firm, commodity, and sectoral issues. This may well have been acceptable in previous periods when the agricultural sector was independent of both the national economy and international markets. Further until the early 1970's, macroeconomic variables such as interest rates and rates of inflation were relatively stable. Internationally, exchange rates were fixed, and international capital markets small and fragmented. The principle macroconnections were through the labor market (Schuh 1976). Hence, it was appropriate to treat agriculture as a "water tight" compartment (Cochrane 1958). All of this changed in the 1970's. The U.S. moved to a floating exchange rate system. The agricultural sector became more interrelated to both the domestic and international economy. Agricultural exports soared to record highs, becoming a major component of the international trade.

Much has been written in the last 10 years about the linkages between the macroeconomy and the agricultural sector and the importance of the agricultural sector to the whole economy. Schuh (1976), has summarized the changes which occurred in the agriculture sector during the early 1970's and their impacts on the whole economy. Since Schuh's 1974 paper, the literature has concentrated on such topics as the exchange rate, inflation, the interest rate, and to some extent in later years, the money supply. A consensus has not developed in this field of economics. Different papers offer different and sometimes conflicting results, while other papers completely ignore issues that other claim are of great relevance. Such papers discuss single macroeconomics variables as the interest rate or exchange rate without any references to other macro variables which affect them, such as the money

supply. It is the intent of this paper to explore some of the macro-agriculture relationships and discuss some of the major studies existing in the literature.

This paper is divided into four sections. The first presents a general discussion of the macroeconomy and its linkages to the agricultural sector. The second addresses the issue of government macro policies and their implications for the agricultural sector. Indirect macro policy variables are the topic of the third section. The second and third section make extensive references to the existing literature, exposing the wide divergence of opinion that currently exists. The fourth section presents the conclusions, and offer some suggestions for future research.

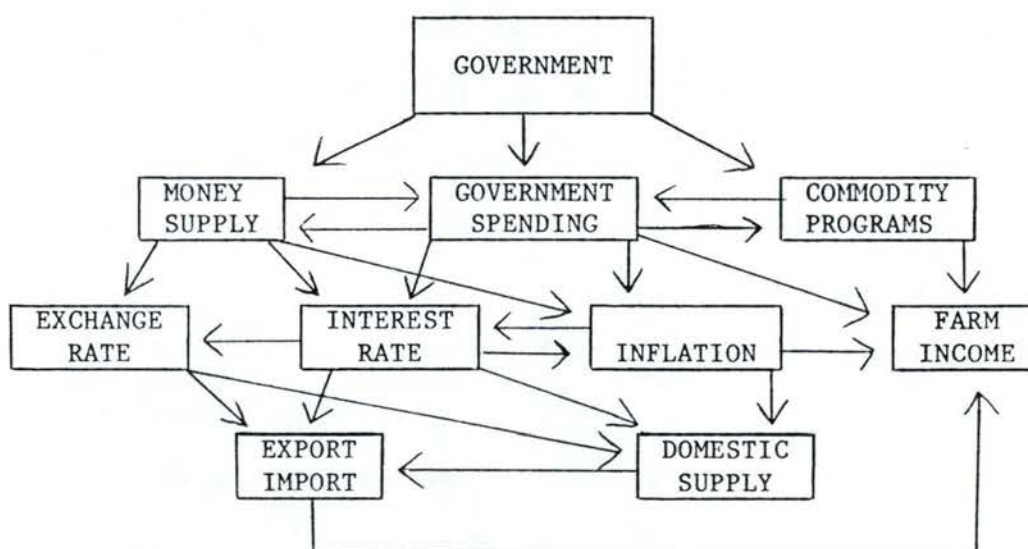
#### Macroeconomics and Agriculture

McCalla (1982) defines macroeconomic policies as those policies which are concerned with aggregate phenomena, such as the rate of inflation, employment, economic growth, etc. These policy instruments include monetary policy, fiscal policy, and international policy via the exchange rate. Since the United States is following a floating exchange rate, international policy is not likely to be affected directly by exchange rate policies. Chambers (1981) underlines the importance of monetary instruments to the agricultural sector via international trade. He identifies three monetary instruments: the money supply, the exchange rate, and the interest rate. The interest rate and the exchange rate are treated as monetary instruments because these variables are exogenous to the agricultural sector. However, when trying to measure the impacts of macro policies on the agricultural sector, the interest rate and the exchange rate should be treated as by-products of direct policies such as

money supply manipulation. Therefore, in this instance, the interest rate and the exchange rate can not be considered as independent monetary instruments.

To better understand the complexity of the interaction between the macroeconomic policies and the agricultural sector, Figure 1 has been provided.

FIGURE 1



There exist three direct government policy instruments of which two are considered pure macro variable policies. These are the money supply and government spending. The government can only directly affect the agricultural sector through commodity programs, taxes, tariffs, regulations, quotas, or export subsidies. The above diagram shows how complex the system is in its structure. Interest rate is not the only variable which has an impact on agricultural exports. Other variables such as the money supply and the exchange rate will have an impact too. Government policy instruments such as the money supply and fiscal policy do not affect directly agricultural variables such as exports and imports or domestic supply, but rather affect

them through their impacts on variables such as the interest rate and the exchange rate. When observing the interactions between the macro policy instruments and the macro variables, a problem of identification occurs. For example, in researching an international trade model for a certain commodity, which variables should we use to explain changes in the export level? Should we use the exchange rate? The interest rate? Or perhaps changes in the level of the money supply?

Further illumination of the problem can be achieved by differentiating between goals and instruments. For example, with a floating exchange rate the government or the Federal Reserve Bank might set a target exchange rate which it wants to achieve. To accomplish this goal, the authority could use policy instruments such as the money supply or open market operations. By decreasing the money supply, the interest rate rises causing capital inflow, and thus, exchange rate appreciation. The same analysis can be applied when the interest rate goal is set at a certain level. When using such analysis in research, the exchange rate and the interest rate both can not be considered as monetary instruments, since only one of two variables is used as a policy instrument to achieve a goal for the other variable.

The literature analyzing macro linkages to agriculture are of two different types. The first type treats agriculture as a subsector of the whole economy within a general equilibrium framework. Such models were presented by Van Duyne (1979), McFall Lamm (1980), and Shei and Thompson (1981). The shortcomings of these analyses are their inability to measure the effects of macro policies on specific export commodities, such as wheat. The second type treats the agricultural sector in a partial equilibrium framework. This type includes models by Schuh (1974), Chambers and Just (1981, 1982), Chambers (1981), Gardner (1981), and others. Partial equilibrium analyses are

very specific in their applications, because they usually measure the effects of specific macro variables on particular agricultural activities such as exports and imports. The results from these studies vary widely and are sometimes even contradictory. The characteristics of these types of models will be explored in the next sections.

#### Government Policy Instruments

1) Money Supply - As a major policy instrument, the money supply affects many aspects of the macroeconomy. The major impacts of changes in the money supply are on such variables as the exchange rate, interest rate, and the rate of inflation. Its effects on the agricultural sector remains an open issue, as the literature is very limited in this area. The studies which analyze the impacts of the money supply on agricultural phenomena can be divided into two different areas. First, there are studies which investigate the causal relations between the money supply and the agricultural price level (inflation). The second type of study analyzes the impact of changes in the money supply on the levels of agricultural exports.

Shei and Thompson (1981), and Barnett, Bessler, and Thompson (1983), investigated the effects of changes in monetary policies on the agricultural prices. Earlier work by Eckstein and Heien (1978) focused on the cause of the 1973 food price inflation. A major conclusion of their work claimed that the cause of increase in meat prices during 1973 was the increase in personal income which was an outcome of the expansion in the monetary base during that period. The study of Shei and Thompson and that of Barnett, Bessler, and Thompson both diverge from the traditional structuralist approach that real events cause inflation. Shei and Thompson develop an econometric model based on real events and the monetary sectors. The theoretical logic which connects

the money supply to inflation runs as follows. Increases in the monetary base leads to excess supply of real balances, causing a fall in the interest rate. As a result, there is capital outflow and a reduction in the international reserves. There is also a tendency by the public to spend money, causing an upward shift in the demand for goods, thus leading to a price increase. The econometric model was simulated to test the effects of four different occurrences: a change in the money supply, an exchange rate devaluation, a decrease in the world production of cereals, and a large increase in Soviet purchases of grain. The results of the study suggest that an increase in the money supply was the largest contributor to the increase in the price level. Using causality tests to show the directions of the effects, the Barnett, Bessler, and Thompson study also investigated the relationship between the money supply and agricultural prices. Previous studies have assumed that causality runs from the money supply to the prices, but empirical tests were not performed. The results of this study support the hypothesis that causality indeed runs from changes in the money supply to changes in the price level. The money supply is active and not passive with respect to the agricultural price level. These studies concluded that the money supply is an important factor and has a meaningful impact on the agricultural sector. However, they do not indicate precisely how the effects of changes in the monetary base are transmitted to agricultural prices, and to what extent the money supply affects these prices directly or indirectly via the interest rate or the exchange rate or both.

Few studies have investigated the direct impact of changes in the level of the money supply on the volume of agricultural exports. Chambers and Just (1981) constructed an econometric model containing an agricultural block, an aggregate export block, and an exchange rate determination block. There are

two unique aspects to their model specification. First, the exchange rate is treated as an explanatory variable rather than just a variable which is used to adjust world prices. The second unique feature is that it measures the impacts of money supply changes on specific commodities such as wheat, corn, and soybeans. The results show that changes in the money supply significantly affect the exports of these commodities. An increase in the money supply leads to depreciation of the domestic currency, thus making domestic goods much more attractive abroad, and improving the terms of trade. In a later paper (1982) Chambers and Just specified the exchange rate as a function of the level of domestic credit, the discount rate, and the price level, thus, endogenizing the exchange rate.

Paggi (1984) tested the causality between changes in the growth of money supply and agricultural exports of wheat and corn. The author's results do not support Chambers and Just's results. There was no significant causality between the growth of the money supply and the level of agricultural exports. Paggi, however, does not conclude that such causality fails to exist. These two conflicting results suggest that the importance of changes in domestic credit remains an open issue for further research, and more work must be done to endogenize some of the macro variables.

2) Government Expenditures-The literature with regard to government expenditures is very limited. It seems that agricultural economists are more involved in the area of monetary policy. One exception to this trend is the work done by McFall Lamm (1980), where a small macroeconomic model was built with an agricultural sector and manufacturing sector linked through income and government expenditures. The results are quite surprising. There is significant positive correlation between the lagged government expenditures and the employment rate, but a negative correlation between current government

expenditures and the employment rate. This result suggests that government policy aimed at reducing unemployment through an increase in government spending is effective only in the short run. However, there is no reference to the same impact on the agricultural unemployment rate. Another interesting result is the indication of an inverse relationship between nominal government expenditures and real agriculture income. This result is contradictory to the Keynesian hypothesis of increased income as a result of an increase in government spending. Following these results, the author reaches a controversial conclusion:

"Since total government expenditures include a component which represents subsidies to agriculture through price supports, and since the component is positively correlated with total nominal government expenditures, the indications are that the price support system may have failed to increase nominal and real agricultural income over the study period."

Lamm is wrong in assuming that, since price support programs are part of the government expenditure system, they also negatively affect agricultural income. Farm programs can be viewed as income transfer programs from one sector to another, and therefore, price support programs enhance farm income. A different view on commodity support programs is presented by Lopes and Schuh in a 1976 unpublished paper. They incorporate exchange rate over-valuation into their conclusions. In their report, price support programs did benefit farmers relative to labor, but this is only to compensate for losses which would have occurred without the programs due to the dollar appreciation.

Meyers (1982) investigated the effects of removing all government programs for corn. The results suggest lower average farm price and lower cash receipts if corn programs were to be removed. A further conclusion is that since soybean prices are closely related to corn price, removal of all

corn programs would also affect the soybean sector in a similar manner. These results contradict McFall Lamm's conclusions that government programs have an adverse effect on farm income.

Though the effect of government programs on farm income might be considered as a microeconomic issue, it is related closely to fiscal policy as farm programs expenditures have increased in the last few years.

The divergent and conflicting viewpoints in the literature suggest that additional research is necessary before the relationship between fiscal policy and agriculture can be fully understood. Fiscal policy may affect the agricultural sector directly through commodity programs, or, alternatively, affect it indirectly through other variables such as inflation, the exchange rate, or the interest rate. In order to be more effective and useful, models which analyze fiscal policy changes and their impacts should measure the effects these actions have on specific commodities as well as the whole sector.

#### Indirect Policy Variables

1) Exchange rate - In recent years the exchange rate has been the most discussed macroeconomic variable in the literature. Since the collapse of the Bretton-Woods structure of fixed exchange rates, the exchange rate is no longer a direct government policy instrument. The literature is quite diverse on its specification, but most agree on the importance of the exchange rate. The exchange rate literature investigates the short-run effects on the agricultural trade. Assuming purchasing power parity exists, the shocks in the exchange rate will have only short-run effect. Neutrality will exist in the long run. The pioneer work in realizing the importance of the exchange

rate to the agricultural sector was done by Schuh (1974). Schuh (1976)

states:

"The evolution to a more open economy and the shift to floating exchange rates makes the management of economic policy a great deal more complex, if for no other reason than that there are more variables to keep track of and more policy instruments to manage."

Schuh concluded that a major contributor to the U.S. farm income problem in the post World War II period was the over-valuation of the U.S. dollar. The over-valuation caused U.S. farm products to be less competitive abroad. In an effort to remain internationally competitive, U.S. farmers rapidly increased their productivity and efficiency through technical change. However, the main beneficiaries of these technical changes were not the farmers, but rather the consumers. Prices of agricultural products dropped and so did farm income, with the magnitude of this reduction in prices and income being determined by the relative elasticities of demand and supply. These results have altered the outlook of many agricultural economists on the importance of the exchange rate and its effect on international trade. A lot of interest and research is now channeled on the effects that changes in the exchange rate have on the agricultural sector. Although most agricultural economists would now agree that changes in exchange rates can have a powerful impact on international trade, there is very little agreement on how this variable should be specified in agricultural models.

Fletcher, Just, and Schmitz (1976) investigated the effects of changes in the exchange rate on wheat exports during the early 1970's. By constructing a simple econometric model of wheat exports, and inserting an exchange rate variable, the authors concluded that the exchange rate had a significant effect on the volume of U.S. and Canadian wheat exports. They

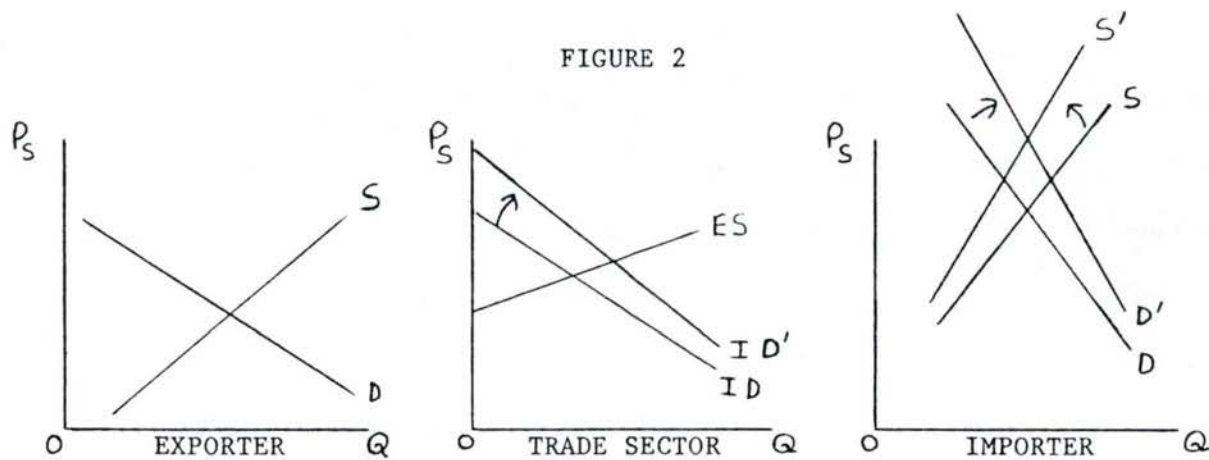
also showed that the exchange rate had a significant impact on the price variation of wheat. As exchange rate depreciates, foreign demand for the domestic commodity increases, putting an upward pressure on the price. This result is contradictory to results of other studies which have not included the exchange rate as a separate independent variable, these studies used the exchange rate to adjust domestic prices.

Van Duyne (1979) considered asset and goods markets to investigate the effects of real occurrences on macroeconomic variables via shifts in personal preferences in asset holdings. In this analysis, real shocks have an effect on the agricultural sector which in turn affects the macro variables. Such is the case with bad weather which reduces agricultural output and commodity stocks. The reduced output leads to a price increase, and the financial yield on commodity stocks becomes negative as the opportunity costs of holding commodities in stocks become larger. The public has the option of switching their preferences from commodity stocks to either domestic money or foreign money. If the increase in the demand for domestic money is larger than the increase in demand for foreign money, then the exchange rate will appreciate with an accompanying decrease in the terms of trade. However, if the reverse is true, then the exchange rate will depreciate, thus improving the terms of trade. The same logic applies when investigating shifts in portfolio preferences. The uniqueness of Van Duyne's work centers on the claim that agricultural shocks can affect macro variables such as the exchange rate, while the majority of other studies investigate the effects of macro occurrences on the agricultural sector. It would be quite interesting to try and obtain some empirical parameters based on Van Duyne's analysis.

Chambers and Just (1981) formulated a dynamic econometric model to investigate the impacts of changes in the exchange rate on the corn, soybean,

and wheat markets. The results indicate that exchange rate changes significantly affect the level of exports. Simulation of the results of 10 percent depreciation support the importance of the exchange rate to the agricultural sector. Other studies which have also confirmed the importance of the exchange rate to the agricultural sector are by Bushnell and Green (1978), Gardner (1981), and Longmire and Morey (1983).

One exception to the above view was introduced by Kost in 1976. Using simple textbook diagrams, Kost illustrates the usual effects of exchange rate devaluation on the exporting and importing countries (See Figure 2).



A devaluation by the exporting country, causes its product to be cheaper in the importing country, thus raising its demand from  $D$  to  $D'$ . Producers in the importing country will produce less since they will receive a lower price for their product, thus reducing the supply from  $S$  to  $S'$ . These shifts in the importer's supply and demand schedules will cause an upward shift in the world excess demand function from  $ID$  to  $ID'$ , raising world prices. The extent to which devaluation affects trade flow and prices depends exclusively on the relative elasticities of the supply and demand functions. Since the elasticities of supply and demand for the agricultural sector are very low, a devaluation will substantially increase domestic prices while inducing only a

relatively small increase in the trade flow. Kost concludes that a devaluation is inflationary to the agricultural sector and has a very small effect on the volume of trade.

An empirical study which supports Kost's hypothesis was conducted by Greenshields (1974). In the early 1970's he investigated the impact of changes in the exchange rate on the U.S. exports of grain and Soybeans to Japan. After estimating the volume of exports to Japan the author concluded that changes in the exchange rate had only a minimal effect on trade flows. For example, only 3.8 percent of the increase in exports of wheat to Japan in 1973 can be attributed to changes in the exchange rate. For corn and soybeans this value is even lower.

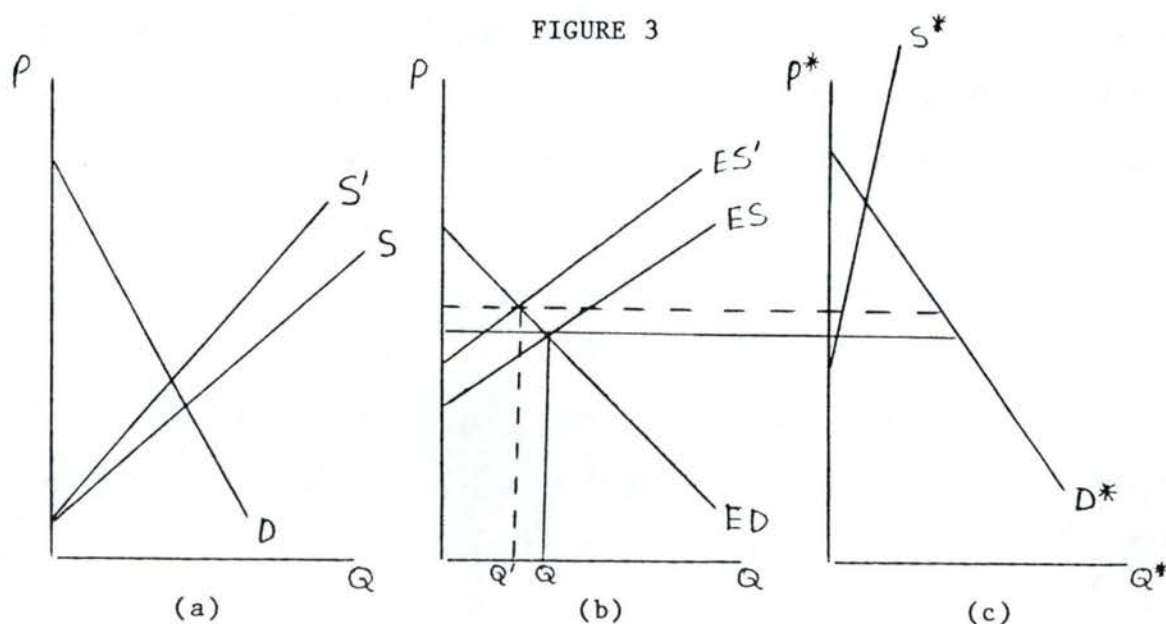
Greenshield and Kost's conclusions emphasize the divergence of opinion in the literature with regard to the exchange rate. However, the majority of empirical studies find a significant correlation between the exchange rate and the levels of exports and imports. More studies are needed to obtain exports elasticities with respect to the exchange rate.

2) Interest rate - Not much attention has been paid in the literature to the impacts of the interest rate on the agricultural sector. This apparent lack of concern is surprising since it is widely believed that the interest rates do have a significant effect on agriculture. Obvious examples include the cost of borrowing money to farmers, or the effect of high interest rates on the levels of exports directly or via the exchange rate. Agricultural economists have usually preferred to use the exchange rate as a variable, although the causality runs from the money supply to the interest rate and then to the exchange rate. High domestic interest rates are causing capital inflow, thus leading to currency appreciation.

Schuh (1976) recognized that interest rates play an integral role in the international scene. He showed that a tight monetary policy will raise the interest rate, thus causing capital inflows and an appreciation of the domestic money, which in turn, makes our domestic products less attractive abroad. Notwithstanding Schuh's logical construct, no empirical measures for the magnitude of the effects of interest rates on the agricultural sector exist in the literature.

However, McFall Lamm (1980) did show a significant correlation between investment in the agriculture sector and the interest rate.

Also, Chambers (1979) found a significant correlation between wheat, corn, and soybean markets and the level of the interest rates. He further analyzed the importance of the interest rate in his 1981 AJAE article. Using a simple diagram (see Figure 3), Chambers shows how a rise in domestic interest rate will shift the supply schedule (see panel (a)) as the cost of borrowing to the farmers increase. This reduction leads to an upward shift in the excess supply function (see panel (b)), thus leading to an increase in prices in both countries and the reduction in the trade flow.



The interest rate is a key determinant of the exchange rate in a floating exchange rate system. Chambers develops a simple model of two countries and one good in an equilibrium state such that the sum of the excess demand functions is zero. Since the interest rate affects farmers production decision, the supply function in both countries is presented as a function of the interest rate, differentiating the equilibrium condition will yield an expression of the effect of changes in the interest rate on the trade flow. Using this procedure Chambers shows that a rise in the interest rate has two negative components with regard to supply and the trade flow. Several simple Granger causality tests were performed, two of which test the causal relationship between the interest rate and the level of exports and imports. The results, contradicting the above analysis, seem to reject the causal relationships between the interest rate and the trade flow.

The literature is very limited in analyzing the roles of the interest rates in the agricultural sector. The existing literature supports the hypothesis of significant correlation between the interest rate and commodities trade flows and supply. However, no significant empirical studies and results are presented to support this hypothesis, although its logic seems to be appropriate.

(3) Inflation - Since agriculture is an important sector of the whole economy and since food expenditures are a significant part of the consumer's budget, any factor which increases the consumer's expenditures is likely to have a significant impact on agriculture and the whole economy. This is why inflation has been the subject of widespread interest in agricultural literature. Inflation in the agriculture sector affects the economy in two ways. First, there are the general consumers who consume agricultural products (food). Second, there are the farmers who need to pay higher prices

for factors of production. The complexity of the inflation within the economy and within the agricultural sector has been demonstrated before in Figure 1. Inflation affects agricultural phenomena such as trade flows, domestic supply, and farm income. On the other hand, inflation will affect macro variables such as the interest rate and the exchange rate.

Schuh (1974) ties the inflation process to the devaluation of the currency. Eckstein and Heien (1978) blame government policies for the 1973 food price inflation. Using results from previous studies, Eckstein and Heien isolated the causes of inflation. They demonstrated that the major factors responsible for price increases included government policies, income growth, which was induced by expansion of the monetary base, and devaluation. These results emphasize that no one specific variable was responsible for price increases.

Gardner (1981) regressed different variables on the percentage change in prices received by farmers and on real farm income. The results are quite different for the short- and long-run. Some of the variables become insignificant in the short-run, and the exchange rate variable becomes the most influential. The results suggest that the recession had a moderate effect on prices received by the farmers, in the magnitude of 10 percent. On the other hand, the influence of a recession on real farm income was much more intense, about 23 percent. The large decrease in farm income may be attributed to the increase in the cost of production. Gardner concludes that farmers have more reasons to avoid periods of recession than the manufacturing sector.

Shei and Thompson (1981) differentiate between the structuralist approach and the monetarist approach for describing the inflation process. The structuralists perceive the inflation process as a result of real occurrences

such as bad weather which reduces the production and raises prices. The monetarist approach considers the inflation process to be the result of an autonomous increase in the money supply. The authors support the monetarist approach by concluding that the money supply was the primary contributor to the increase in the price level during the early 1970's. However, they caution that the money supply was not the only variable which fueled inflation during that period. The question of how changes in the money supply affect the food price level remains a debatable issue. Some economists believe that the transmission process is through the exchange rate, while others believe that inflation is a result of increased expenditures which were stimulated by an expansion of the money supply.

In recent years, much has been written about food price inflation and its effect on the agricultural sector. The major trend in explaining the inflation process combines the structuralist and monetarist approaches as Shei and Thompson did. In spite of its importance, not much has been written in recent years about the effects of inflation on other agricultural phenomena such as production, farm income, and trade.

Schuh (1981) summarized the effects of inflation on the agricultural sector. Inflation had a major impact on farmers because they have to pay more for the factors of production. If prices of output were to go up by the same rate, then farmers would not bear a disproportionate share of the costs of inflation. However, agricultural output prices vary a great deal more than other product prices and the full costs of inflation can rarely be passed on to consumers. Farmers operate in a state of high uncertainty, which is exacerbated when the production process is long and financed through loans. The inflation process also appreciates the value of the land the farmers own. Such appreciation is beneficial to farmers because it increases their wealth.

However, new entrants must pay higher prices for land and expansion becomes more costly. Schuh summarizes by stating that since inflation is linked to the money supply, government expenditure, exchange rates, and other variables, an unstable inflation rate will make these policy variables much harder to control.

### Summary and Conclusions

As noted before, the literature on the macroeconomy and its relationship to the agricultural sector is quite new and by no means complete. There is still much that is not adequately described or fully understood, especially in the area of model specification and interpretation of results. The existing studies diverge in their model specification; furthermore, they diverge in their results and conclusions. The literature seems to be unified in its assessment about the importance of the agricultural sector to the macroeconomy and about the importance of the macro variables to agricultural modelling. When reviewing the existing literature there are two questions which must be answered. First, is there a consensus on the conceptual framework of the models? Second, is there a consensus with regard to the empirical results? If the answer to both questions is positive, then there is no need for much alteration of the existing models. However, as can be detected from the existing studies, the answer is not positive for either question. Furthermore, it seems that the answer for the first question is negative and the divergence lies in the conceptual framework.

Currently, there are two basic directions to the existing literature. First, those studies which concentrate on direct macro policies such as monetary and fiscal policies. The second group of studies focuses on the effects of indirect macro variables such as the exchange rate, the interest

rate, and the inflation process. The research which deals with the direct macro policies is not totally independent of the indirect macro variables, because they do affect those variables. For example, the money supply affects other macro variables such as the exchange rate and the interest rate which, in turn, affect the agricultural sector.

The literature seems to agree on the importance of monetary policy to the agricultural sector, but in their empirical estimates these studies measure the direct impact of changes in the money supply on agricultural phenomena. Although the money supply affects the agriculture sector, it also affects other variables which have an impact on the agricultural sector. Therefore, a model which measures the impact of changes in the money supply must also account for the indirect effects of changes in the money supply via the exchange rate and the interest rate. The literature, with regard to fiscal policy, is very limited, and the magnitude of the impact due to increases in government spending is still unknown. The government does not use strictly monetary or fiscal policy to achieve its goals, but rather a combination of the two, and this makes it difficult to separate the impacts that can be attributed to either policy. There are four different scenarios under which the government could operate: 1) loose monetary and fiscal policies; 2) loose monetary policy and tight fiscal policy; 3) tight monetary policy and loose fiscal policy; 4) tight monetary and fiscal policies. The effects of government policies on the other macro variables and on the agricultural sector will be different under each scenario. For example, under tight monetary and fiscal policies we expect a decrease in the money supply, a rise in the interest rate, appreciation of the exchange rate, a recession, and a decline in the trade flow. However, when considering a tight monetary policy and a loose fiscal policy some of these impacts will be smaller and a

recession will not necessarily occur. This kind of an analysis is important if we are to consider all possible effects of direct macro policies.

Studies which concentrate on indirect macro policies comprise the bulk of the literature in this field, especially those studies which dwell on the exchange rate. In the literature there is no consensus on how the exchange rate variable should be structured in a formal model.

Not surprisingly, these conceptual differences produce a variety of results. In some cases, models with different formal structures of the exchange rate variable produce not only different results but lead to conflicting conclusions. If these models lead to conflicting results, then it is imperative that we determine the appropriate structure for the exchange rate variable. The literature offers two basic options. The first option is to adjust domestic prices via the exchange rate. This will produce the Kost and Greenshield's conclusions of insignificant correlation between the exchange rate and agricultural exports. The second option is to treat the exchange rate as an independent explanatory variable, as did Chambers and Just, etc. Their results confirmed the importance of the exchange rate to agricultural occurrences given their model specification.

Although the interest rate is a major macroeconomic variable it has been the least explored topic in the literature, because researchers prefer to use the exchange rate as an explanatory variable. Existing studies acknowledge a significant correlation between the interest rate and the agricultural sector; however, these studies are few and limited in their empirical results. Domestically, commodities which require a high degree of capital investment will be affected more than those commodities which require less capital. Internationally, high domestic interest rates attract foreign capital and bolster the value of domestic money with an accommodating decrease in the

terms of trade. Since the interest rate affects agriculture both domestically and internationally, it should be formally structured in agricultural models.

The topic of inflation and its causes are covered quite well in the literature and there is wide agreement on the importance of inflation to the agricultural sector. However, the impacts of inflation are not evenly distributed and these should be investigated. Inflation will affect the producers who buy increasing amounts of inputs from the nonagricultural sector. Inflation will also affect the consumers who must pay higher prices for the food they buy. However, if demand for agricultural products is inelastic as some studies suggest, then higher food prices will not greatly affect the demand for agricultural products, and therefore, producers will not face decreasing revenues. Such impacts should be investigated when analyzing the effects of inflation on agriculture.

One of the important issues that emerges from the above analysis is the need to measure the impacts of macroeconomic policy variables on specific agricultural commodities. Knowing the effects on the individual commodities will enable us to make some inferences on regional impacts of macro variables. One way to analyze different commodities impacts is divide them into four groups: 1) commodities which are highly dependent on macro variables and the international markets such as cotton; 2) commodities which are highly dependent on macro variables but play a minor role in international market, such as the broiler industry; 3) commodities which do not require large capital investments and therefore are not significantly impacted by macro variables, and are not dependent on international markets, such as the cow-calf industry; and 4) those commodities which do not depend heavily on domestic macro policies but do depend on the international market, such as

wheat. Such a division could enhance our ability to isolate and analyze the impacts of macro policies on different commodities.

This paper has surveyed some of the major studies existing in the literature with regard to the linkages between the macroeconomy and the agricultural sector. The wide divergence of opinion in the literature has been noted and an explanation for this divergence has been presented. Suggested directions for future research have also been made. It is important to note that some of the divergence in the literature is an outgrowth of the basic disagreements that exist amongst different schools of macro theories. It might be the case that as long as macro theorists debate the validities of Keynesian theory, Neo Keynesian theory, Permanent income, and other theories, the conceptual divergence in our literature will remain.

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