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UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

# PRICE REFORM OF THE FOOD AND AGRICULTURAL MARKETS IN CHINA: 1978-1993

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

by

XIANGYUAN ZHU

Norman, Oklahoma

1997

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PRICE REFORM OF THE FOOD AND AGRICULTURAL MARKETS
IN CHINA: 1978-1993

A Dissertation APPROVED FOR THE
DEPARTMENT OF ECONOMICS

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# Biographical Sketch

Xiangyuan (Sue) Zhu was born in on September 27, 1953. She grew up in Xiaogan, People's Republic of China, quoting from Mao Zedong's "Little Red Book". In 1966 while in the seventh grade her formal education was cut short when all schools and universities were closed for ten years during the Cultural Revolution.

In January 1969, like most middle school students at the time, she was sent to the countryside to work as a farmer for one and half years for "re-education". Afterward worked six years in China's factories, and served half year as a soldier in the army. She worked in the Commerce Ministry's Wuhan Cereal Oil Research Institute between 1976 to 1979.

In 1979, she passed the National Entry Examination and became one of the three out of every thousand candidates going to a college in Beijing. Receiving a B.S. in chemistry education, she then began to work as a government administrator in the Price Bureau of Jiangxi Province, administering the price reform program. In 1986, she passed the national examination for the World Bank in China and became interested in studying in the United States.

In 1989, she went to the University of Kansas to begin her graduate study and received a M.A. in Economics in 1991. In 1992, she went to the University of Oklahoma for the Ph.D. program. In Norman, she enjoys the blue skies, brilliant sunsets, and the friendly folks of Oklahoma.

To my Parents and Daughter

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Times fly! It is hard to believe that more than eight years have passed since I began my graduate study in the United States. To my parents: my mother, Xinhuan An, my father, Qinghui Zhu, and all the friends, teachers, and colleagues I encountered along the way during this eight-year graduate study, I am deeply grateful for your support and guidance.

Although the number of pages needed to express my appreciation to all those who contributed to this effort would certainly exceed those already in this dissertation, a number of people merit special mention. I would first like to thank six people who, as mentors and friends, have been extraordinarily influential in my personal and academic development. Prof. A. J. Kondonassis, the chair of my Graduate Committee, introduced me to the field of economic development and encouraged me to go on to obtain a Ph.D. I continue to look toward the simplicity and clarity of his analysis as an inspiration for my own work.

Dr. David Huettner, the chair of our Department, illustrated by quiet example the importance of opening your own ideas to criticism and of believing in others so

that they will give you their best. His willingness to listen, to exchange ideas, and to press me to develop research and teaching skills is appreciated.

Ambassador E.G.Corr, the member of my Graduate Committee, enabled me to have the knowledge and insight into how to properly frame the policy analysis. His warmth and ever-ready support was there from the beginning. By providing constant reminders of the importance of making research relevant to the task of improving the lives of the poor, he brought humanity to my work.

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## LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| 2SLS | — | Two-Stage Least Squares |
| AOF | — | All other factor |
| CLR | — | Classical Linear Regression |
| CPI | — | Consumer Price Index |
| DF | — | Dickey-Fuller |
| DS | — | Demand and supply |
| ECM | — | Error Correction Model |
| GATT | — | General Agreement of Tariffs and Trade |
| GDP | — | Growth Domestic Product |
| GNP | — | Growth National Product |
| HRS | — | Household Responsibility System |
| IC | — | Instantaneous causality |
| ICP | — | International Comparison Project |
| IMF | — | International Monetary Fund |
| IV | — | Instrumental Variable |
| OLS | — | Ordinary Least Squares |
| PRC | — | The People's Republic of China |

| | | |
|---|---|---|
| SPC | — | State Price Committee (in the former Soviet Union) |
| SSB | — | The State Statistic Bureau in China |
| SYC | — | Statistical Yearbook of China |
| TVE | — | Township and Village Enterprises |
| USSR | — | Union of Soviet Socialist Republics |

**Abstract**

This work examines price reforms in both food and agricultural markets within China from 1978 to 1993. This work then found that pragmatic economic reforms in agriculture generally became successful in that they raised the overall income of those peasants comprising more than eighty percent of the total Chinese population. These reforms also increased savings in the rural sector and tax revenues for the presiding governmental infrastructure. Concomitantly, the reforms also stimulated demand for industrial products, which in turn provided new opportunities for more-competitive enterprises.

Next, rising agricultural productivity in response to these reforms released labor forces from agriculture, thus entirely replacing collectivism with "peasant capitalism." Both events then resulted in an increased food supply for the rising urban population. Here, rising agricultural productivity contributed significantly to China's strong, overall economic growth, thereby ensuring the reforms' endurance. Above all, the agricultural reforms changed the Soviet pricing system (in food and agricultural markets) and created an almost completely free market-pricing system. These markets, along with their increasing capability to detect relative scarcities and opportunities, have ultimately become the chief guiding force for resource allocation.

This work simulated resultant, food and agricultural product prices as a function of various supply and demand factors. During these simulations, the author both formulated and tested several hypotheses regarding certain economic factors that affect price formation. Here, the limitations of the present value model were explored in the context of China's food and agricultural markets. Surprisingly, the results did actually confirm that price formation remains a function of economic fundamentals, thus again proving dependent on supply and demand. As discussed in this work, a time-series Error Correction Model provides one way to acknowledge this crucial fact. The results reported here in therefore suggest a more appropriate way to structure future econometric estimations.

## CHAPTER ONE

## INTRODUCTION

The great and rapid transformation taking place in the former socialist countries of Eastern Europe, the former Soviet Union and China is characterized as a shift from centrally planned economies to market economies (Chavance, 1994). These countries also have undergone dramatic changes politically because of a resurgence of nationalistic and ethnic loyalties and democratic movements. Geopolitically, Yugoslavia exploded and part of the country has been ravaged by war. The Soviet Union collapsed, fragmenting into fifteen states, which includes the still vast Russia, while Czechoslovakia split peacefully in two.

Since the beginning of the transformation process, the political leadership in both the East and the West as well as the International Monetary Fund (IMF) and World Bank have developed specific theories about "the transition to a market economy." Most economists in the East as well as the West, inspired by free market ideas, have been particularly optimistic about the transition (Chavance, 1994). Their implicit point of departure was a simplified model of Western capitalism: a system characterized by

market coordination based on private ownership. Thus, they saw the transition as a shift through universal deregulation of an artificial and irrational order based on planning and state ownership to a spontaneous, self-regulating, and rational order, the market economy.

This proposition, which empirical evidence generally appears to support, is the fundamental precept that has guided past and current efforts of economic reform (Garrett, 1995). This version of how the world works, greatly influenced the design of the transition programs carried out in many former socialist countries. Therefore, the key to success has been thought to be a rapid transformation of the system of ownership, hence the importance of speedy privatization and price reform, that is, "getting prices right."

These transitional programs assume that a speedy systemic change would permit the self-regulating order of the market to develop quickly and spontaneously. In addition, the economists assume that the fewer distortions there are in price formation, the better. Theoretically, without such distortions, domestic prices would accurately indicate the true cost (or benefit) of a resource to a nation's economy. This would ensure optimal allocation of a nation's resources and lead to sustained economic growth (Garrett, 1995).

These naive assumptions, which over-simplified the history of all functioning capitalist systems, and which did not consider the lessons of earlier economic reforms in the socialist countries, have been proven false. Even though an old economic system can be dismantled quickly, the creation and stabilization of a new one takes a long time. A realistic strategy for transformation should take economic into account that this kind of systemic change entails an evolutionary process and gradual learning (individual, organizational, social). There are lags in price transmission from one level of the market

to the other. Price changes take time to work through the market system (Commander, 1989).

Because of this, economic and price reforms in China must be seen as a large-scale program of transformation. It employs a series of institutional measures designed to produce improvement in the performance and functioning of the economic system, while still maintaining state ownership and a single party dictatorship.

Reforms in the former Union of Soviet Socialist Republics (USSR) and East European countries emphasized political aspects and concentrated on industrial areas. In contrast, China's reform has its deliberate strategy of limiting political change that could undermine the regime's legitimacy. Besides, China's reform oriented from pragmatism, and placed emphasis on agricultural areas (Ma, 1995).

**The Two Primary Objectives of this Study**

The first objective of this study is to ask if the strategy being followed by the People's Republic of China can be justified by reviewing or adjusting currently held economic theory, or through empirical research. Looking at these areas is part of that adjustment.

The second objective is to use a present value model to find the price formation pattern in China's food and agricultural markets. This quantitative analysis will be important for identifying the impact on both (a) lower and moderate income families, and (b) agricultural surplus countries outside China, because China's demand has significant impact on the international market price.

This study will attempt to explain the Chinese case by focusing on price reform in the food and agriculture markets. The quantitative studies in this thesis will attempt to provide price formation patterns for several foods and agricultural commodities in China's food and agricultural markets. These pricing patterns have important implications for research on a dynamic income distribution. Accordingly, the research on the dynamic income distribution has implications for the design of price reform and economic transition programs.

In the remainder of this chapter, I will (1) expand on the motivation for the research, (2) describe the contribution of the research to our knowledge of the economic reform, price reform and development of agriculture, (3) note the potential of the findings to assist in policymaking and policy analysis, and (4) explain the selection of China as the country to be used for this study.

**Motivation of the Research: Transformation as Context**

As noted, great transformations are taking place in the former socialist countries of Eastern Europe, in the former Soviet Union, and in China as they shift from centrally planned economies to market economies. The transition programs consist mostly of sets of policies intended to liberalize the economy to promote growth and overcome the problem of shortage in centrally planned economies (Chavance, 1994).

From the beginning, economists have stressed that the success of these economic reform efforts (and the reform efforts of the other nonmarket economies) would hinge on "getting prices right" (Hartland-Thunberg, 1989). The more pertinent issue is how

relative price relationships expressed the various degrees of scarcity among goods and services in the still partially controlled economy. The process of price reform could affect social groups differently, depending on consumption and production patterns. A negative impact on the lower and moderate income families might be a particular cause for political concern. Most people were sold on reform by its promise of a better life. However, it was not entirely clear to them that with reform would come new discrepancies in the distribution of income, wealth, and opportunity. This gap between perception and reality has resulted in shock, dissatisfaction, pain, and a sense of loss (Wang, 1994). It would have been better to have policies or programs to reduce the negative impacts of differential rates of price reform. Up to now researchers have not done a good job of identifying these impacts.

Moreover, food production has always been of crucial importance to political and social stability of China. Thus, the importance of agricultural development in China can hardly be over emphasized. In this regard, it is imperative that this study look at the path of agricultural development and the kind of strategies employed for agricultural development in China.

**Contributions of the Research**

The primary aim of this study is to explain the Chinese case by focusing on price reform in the food and agriculture markets. However, we have to be aware that the transformation from central planned economies to market economies is an organic and complex process. It has both internal conflicts and an overall consistency. The reform of

socialist economies and the transformation of their social systems already rank among the great historic experiments. Thus, the interpretation of this process is a challenge, a source of controversy, and an opportunity for further development for the various social sciences. These concerns are the same as for the industrial revolution, the crisis of the inter-war period, and the changes seen in the less-developed countries over the past few decades (Chavance, 1994). This study has significant implications for agricultural surplus countries.

Economics theory has not yet integrated work on agricultural development and price reform in China's food and agricultural markets. This study will provide a complete picture of the process in such markets, and stress the importance of agricultural development in the transitions.

This study presents a better model of price formation for understanding the dynamics of the internal and operating mechanisms through a general quantitative analysis. Researchers and policymakers can use the results to better understand economic phenomena as disparate as the degree of the consumption and production response to changes in economic fundamentals. More directly, the findings can suggest how policy reforms will affect the political, economic, and market conditions that govern the transition and, consequently, how these transitions will affect overall price formation.

The ultimate objective of the research is to provide a methodology for improving policymaking and policy analysis to improve the welfare of individuals, especially those of lower and moderate income. By understanding price formation, we can contribute to our understanding of how reform will affect society's most vulnerable groups. A well-

designed reform program should bring most people a better life. Policymakers can then incorporate this information into the design of reforms to minimize negative impacts (Garrett, 1995).

**The Choice of China**

This study focuses on price reform in China's food and agricultural markets. Specifically, I will examine reforms for both price and agriculture. The reforms presented here focus on changes in the economic systems and institutions. Data for the urban consumer goods and agricultural producer goods run from 1978 to 1993.

Due to the reform process, China has moved steadily toward a market oriented economy. More than a fifth of the world population, of which 80% are peasants, is participating in a historic transformation of its economic and social systems. The enormous momentum that is now building within the Chinese economy will be felt around the globe in the decades to come.

China's economic reform offers a unique case study in the transformation of a central planning economy into a semi market economy. Among the various economies currently undergoing or that have undergone parallel transformation, China so far seems to present a more incremental and cumulative pattern of institutional change. China's experience deserves scrutiny for the information it provides about the relationships among reforms, the social and economic context of the changes, and the pace of this transformation. The mechanism for implementing price reform is embedded in a given institution (Wang, 1994).

Examination of China's reform touches upon the fundamental questions of how the agricultural reform effectively promoted economic development and how that development laid the foundation for further reform. Understanding such a reform process can help to explain further the primary factors of economic performance both in China as well as in other reforming economies.

**Organization of the Dissertation**

Chapter One will place research into the framework of transformation of the socialist system. Chapter Two will give a brief political and economic history of the reforms since the 1950s. Chapter Three will place the reform into the Chinese food and agricultural markets.

The next three chapters will concentrate on methodology, and will describe the conceptual model, data, and estimation procedures. Chapter Four will describe the conceptual model within the context of a review of the relevant literature, state the research hypotheses, and present the complete models to be used to test the hypotheses. Chapter Five will discuss the selection of commodities for analysis, the data, and the behaviors of Chinese consumers and producers. Chapter Six will describe the econometric models and methodological issues of estimation.

In the last two chapters, we will present and discuss the results (Chapter Seven), and then note the policy implications of the findings and suggest areas for future research (Chapter Eight).

# CHAPTER TWO

## Background: Transformation of Socialist System: Economic Reform Since the 1950s

The particular domestic and international political and economic circumstances facing socialist countries has determined the structure of their price reform programs (Chavance, 1994). In the former socialist countries, the evolution of the society itself always has had a major impact on price reform -- sometimes facilitating it, sometimes restricting it. China is a socialist country outside of the Soviet bloc. China's internal developments have played a major role in most reforms. However, China was also deeply influenced by external events, especially those in Eastern Europe and the Soviet bloc.

The time period covered by this study is from the late 1970s through the early 1990s. This chapter summarizes transformations and economic reforms in the socialist systems since the 1950s to provide background for understanding the price reforms.

### The Soviet system

After World War II, the new socialist regimes took different paths and moved at different rhythms in implementing radical institutional changes. They all adopted a system based on what they believed to be the ideal model for a socialist economy -- the Soviet

system. It had developed in the 1930s, and seemed to have been legitimized by the victory over Nazi Germany. Many of them believed Stalin's socialist economic structure was the only approach for a country to go beyond, or bypass altogether, the capitalist stage of social development. This economic structure was based on collectivized agriculture, state-owned industry and banking, and central planning. Its goals were to produce rapid structural changes and accelerated growth. It was this system, copied by other socialist countries from the Soviet Union, that the reforms since the 1950s have sought to modify (Chavance, 1994).

There were a number of interrelated factors highlighted in the Soviet development model. One of the most important factors was a strategy designed to produce rapid growth through a high investment rate and industrialization concentrated in heavy industry. This development strategy combined with faulty planning frequenlly produced shortages, and these shortages taught individuals and corporate groups adaptive behavior. The main characteristics of the Soviet model were an ever-increasing asymmetry in favor of the industrial goods sector, residual growth of consumption, lagging agriculture, self-sufficiency tendencies, and regulation through shortages (Brus, and Laski, 1989).

The uniqueness of the Soviet system lies in the combination of state ownership and a single-party dictatorship. The single-party dictatorship made possible state ownership of the means of production. The focus of this dissertation is on the price reform and state ownership, not on single party dictatorship. We will now look at state ownership, collectivized agriculture and other elements of the Soviet model.

State Ownership

In Eastern Europe and the Soviet bloc, the change from private to state ownership occurred rapidly in the nonagricultural sector. As the result, the state owned almost all property, not only in industry, but also in the banking, construction, transportation, and commercial sectors. The Soviet Union first developed economic planning as an interconnected set of institutions and procedures in the 1930s. At the heart of this planning system was the state-owned industrial sector. This planning system was supposed to carry out an ambitious strategy for development and structural change. During the late 1940s and early 1950s, the East European countries copied it. In China, it took place in the mid-1950s, and the former owners were paid compensation (Wilczynski, 1972).

Collectivized agriculture, monopoly of foreign trade, and restrictions on the private sector are the three additional critical elements of the socialist model. Although they were important to the system, they turned out to be more amenable to reform than the rigidly defined state ownership of industry, the single-party dictatorship, and centralized planning. The more reformable elements are more relevant to the focus of this study, and will be briefly described.

(1) Collectivized Agriculture

During the 1950s, the institutional framework of agrarian collectivization emerged. It was less brutal in Eastern Europe and China than in the Soviet Union. In the collective system, land was collectively owned and cultivated, except for small and restricted family plots. An exploitive tributary for agriculture was developed. Peasants

had to sell their products to the state at fixed prices, which were always set very low. In Eastern Europe and China, the terms of trade between agriculture and industry deteriorated sharply during the 1950s (Hewett, 1988).

(2) The Monopoly on Trade

The state used the monopoly on foreign trade to control all foreign exchange, both its volume and its structure. Thus, central planners could integrate foreign exchange earnings into the economy, and protect infant industries from new international competition. The socialist economists claimed, then, that this was the socialist economies' trade aversion, at least compared with capitalist countries (Wilczynski, 1972).

In terms of international trade, state centralization created a barricade between domestic producers and their foreign partners. The planning agency determined prices for goods imported and exported. Only the central trade organizations could conduct sales and purchases. Certainly, there was difference between international market prices and ones determined by the planners domestically. The profits and losses, stemming from this difference, became part of the state budget, not that of the domestic producers and consumers involved. The fixed exchange rates played a totally passive role. Enterprises were not allowed to have direct contact with their foreign partners. Domestic prices were disconnected from international market prices. Similarly, domestic retail prices were divorced from wholesale prices. The national currencies were nonconvertible (Thornton, 1976).

(3) Restriction of the Private Sector

The Soviet Union virtually eliminated the private sector, except for the small private plots on collective farms. In like manner, China strictly limited the number and size of legal private enterprises, except for the small private plots for peasants in the countryside.

Systemic Adjustments to the Socialist System

The initial systemic adjustments began in East European countries and the Soviet Union in 1950s. They attempted to perfect the socialist system, to make the system more rational and flexible within its institutional base (Chavance, 1994). These reforms tried to better harmonize the behavior of individual workers, enterprises, and the state. They focused on improving management methods within the framework of central planning.

At one point or another in their histories, eventually all the socialist governments tried these types of systemic adjustments (Adam, 1989). There are three typical examples: (1) Poland, whose theoretical influence on later policy reform was considerable, (2) the Soviet Union, which mattered because of its ideological and political "leading role," and (3) China, which exhibited a certain originality in this area (Chavance, 1994).

**Poland's Theoretical Influence**

In 1956, a revolt against Stalinism and the desire for "socialist renewal" rocked the Polish political landscape. The radical change after Stalin's death in 1955 began with the workers' revolt in Poznan, the October uprising, and Wladyslaw Gomulka's return to

power. At the same time, the first workers' councils appeared, and the decollectivization of agriculture began. Although the reform experiments did not last long, they had an important intellectual impact on reforms in other countries (Pysz, 1987).

From 1965 to 1968, the Polish government made limited attempts to get reform going again. The reform was based on local experiments with some partial modifications. These reforms had little practical impact (Paul, 1986). In 1968, a political crisis led to an "antirevisionist" purge. The reform economists were among the principal victims in this purge. In 1969 and 1970 the questions of incentives and price system reform arose again. In January 1971, the reform used a new way of calculating the administered price of production goods. For some goods, it introduced price ceilings. In other goods, it allowed prices to be determined contractually. In those years, inflationary pressures had built up as part of a general austerity program. Significant price increased in food at the retail level. The Polish government planned to freeze wages until 1972 at their 1970 level. The freezing was implemented crudely just before Christmas in 1970. The food price increases led to the workers' revolt in Gdansk. The protest movement was quickly suppressed, but it did contribute to Gomulka's fall (Chavance 1994). His successor was Edward Gierek. He began his rule by canceling the price increases and the system for economic stimulation. According to Chavance (1994), this first "veto" of the Polish workers represented a critical step on the path that led the country to support Solidarity, and led Eastern Europe as a whole to the events of 1989.

During the period of 1973-1975, Gierek adopted a voluntarist strategy for accelerated growth. It attempted to combine an improved standard of living with a

strong expansion of investment. In early 1980, a reform more radical and wide-ranging than that of the 1970s was envisaged. Meanwhile increased economic tensions reached a boiling point -- declining production, shortages (and rationing), inflation, growing foreign debt, and balance-of-trade problems. In December 1981, the country plunged into a bizarre period. It was a combination of the state of emergency, a social crisis with attempted economic reform (Kornaï, 1990).

The exacerbation of economic tensions that had marked the end of the 1970s unleashed the social crisis of 1980. It led to a government announcement of hefty retail price increases, the third increase in ten years. Solidarity had to focus on the struggle to gain recognition for itself and on defense of the population's standard of living. Since the spring of 1981, the union leaders had changed their approach to focus on constructive proposals for economic reforms and management, because of the worsening of the economic conditions and the impotence of the government (Kornaï, 1992).

The government lost control over the budget, the banking system, and the balance-of-payment's situation during the end of communist rule in Poland. Strikes and demands for higher wages met the austerity policy. In 1988, inflation reached 60 percent, and wages rose even faster. The zloty (Polish currency) was devalued several times. In the spring of 1989, the historic "round table" accord opened the process. It led to the first noncommunist government in Eastern Europe in September. This government, headed by Tadeusz Mazowiecki, enjoyed considerable popular support. However, the country was also drifting into hyperinflation (Adam, 1989). During the fall, prices increased 35 and 50 percent per month. The economist Grzegorz Kolodko

analyzed the "shortageflation" syndrome as typical of the crisis of the 1980s. It was changing to "shortage-hyperinflation" during that time. As a result, the minister of finance, L. Balcerowicz, along with experts from the IMF and the World Bank, developed the "shock therapy" approach for 1990. It undertook two related tasks: rapid stabilization and radical transformation of the system as a whole (Chavance, 1994).

The Balcerowicz plan combined these two goals. It gradually became clear that the stabilization policy, which went into effect on 1 January 1990, really was a shock treatment, and the transition to a market economy required longer-term changes.

The strategy of shock therapy had mixed effects in 1990. It caused a national and international debate about how the effects should be interpreted. There were several successes on the monetary side. These included (1) the death blow to hyperinflation, (2) the clear reduction in the inflation rate (though it did still remain quite high), (3) the disappearance of shortages, (4) the re-establishment of confidence in the national currency, (5) the stability of the new exchange rate, and (6) a strong surge in exports, which helped the balance-of-payment's situation. However, the shock therapy had an unanticipated impact on the national economy in 1990 -- such as (1) a fall of 12 percent in GDP and of 25 percent in industrial production, (2) a sharp drop in real wages, and (3) the appearance of one million unemployed workers, which was almost the three times of the predicted figure (Chavance, 1994).

**The Soviet Union: Its Ideological and Political "Leading Role"**

Between the 1956 Twentieth Congress of the Communist Party of Soviet Union and Mikhail Gorbachev's accession to power, Soviet authorities made a number of attempts at systemic adjustment (1957, 1965, 1973, 1979, and 1983). These attempts varied in scope, but all had disappointing results (Nove, 1986).

The underlying support for reforms was based on the Soviet system's defects and an awareness of the failure of systemic adjustment to reduce them to any significant degree (Chavance, 1994). Supporters of reform remained fairly optimistic about an appropriately redesigned version of socialism's capacity to surpass capitalism in terms of growth, rationality, and social justice. The definition of socialism was reduced to the institutional base. Planning was kept, but it was no longer totally centralized. A central theme in reform was the combination of planning and the market. The plan would guide growth with a long-term perspective and flexible control of investment. The market would have responsibility for regulating everyday microeconomic decisions. Hence, reform was no longer simply the modification of socialist planning. Reforms in other areas (agriculture, foreign trade, the private sector, and power within enterprises) accompanied the change in the systemic core (Kornaï, 1992).

Meanwhile, reform took place in four other socialist countries. The reform took place in Yugoslavia during the 1950s and early 1960s, where the distance from the initial Soviet model grew wider and wider, after Tito achieved autonomy from the Soviet Union. Similar reforms were tried in the second half of the 1960s in Czechoslovakia and

Hungary (Ahn, 1989). Finally, in the 1980s, the most durable reform took place in China. Deng Xiaoping's "fumble the stone to cross river" began in the agriculture.

**China: Its Originality in the Reform Area**

China's society was a predominantly rural one. Agriculture deeply influenced the political and economic evolution of the socialist regime. In the mid-1950s, two important changes occurred to China's socialist system. The first was a modified application of the Soviet model in industry. This systematic application was introduced more gradually. The industry's share of economy as a whole was much smaller. The second was the collectivization of agriculture, which was carried out in 1955 and 1956. For several reasons, it caused less conflict in China than in the other socialist countries (Riskin, 1987). The collectivization was surprisingly successful in the initial stage. From 1952 to 1958, the gross value of agriculture (measured in constant prices of 1952) increased 28 percent and grain output increased 22 percent.

In 1956, Mao Zedong began to criticize the Soviet model of organization and development. After that, Mao's criticisms became increasingly radical. Mao introduced a series of reform and factional struggle. These reforms oscillated between systemic adjustments and non-market oriented reforms. It was possible for Mao to rule China, because of the unified system of ownership and the high centralization of political and economic power. Mao had no intention of creating markets (Chavance, 1994).

The catastrophic Great Leap Forward and the political fluctuations between 1959 and 1961 resulted in a profound agricultural crisis (Lin, Burcroff II and Feder, 1993).

The gross value of agriculture dropped 14 percent in 1959, 12 percent in 1960, and another 2.5 percent in 1961. Above all, grain output was reduced 15 percent in 1959, another 16 percent in 1960, remained at the same level of 1960 for 1961, and did not recover to the 1952 level until 1962. The dramatic reduction in grain output resulted in widespread and severe famine. Thirty million people were estimated to have died of starvation during this crisis. From 1952 to 1978 the average annual growth rate in grain production was 2.4 percent, only 0.4 percent above the population growth rate. Per capita availability of grain increased only 10 percent over a period of 25 years.

The inability to raise living standards substantially after 30 years of socialist revolution frustrated the Chinese leadership. After Mao's death in 1976 the national economy was on the edge of collapse. Since 1978 economic pragmatism has been clearly the orientation of reform under Deng Xiaoping. This reform was sustained by public weariness after years of factional struggle. It was a deliberate strategy of limiting political change that could undermine the regime's legitimacy. The leaders' principal desire was to "modernize" the country with a rapid economic development, while remaining the system's institutional base. The leaders still referred to the system as "socialist," but it no longer means what it used to mean (Woo, 1991).

Agriculture was the first area of reform for two major reasons. First, the people's communes were objects of ever-increasing criticism. The Maoists had stressed that the vast collective organizations had several benefits. Along with their functions for social control through the apparatus, they played a major role in building up the agricultural infrastructure. Besides, they improved health and life expectancy of the rural population,

and expanded primary education and other cultural and social services (Liu, 1994). In 1976, the reformers questioned Mao's political, economic, and administrative leadership. Furthermore, they pointed out the weakness of material incentives for peasants in the collective commune system. Above all, the agricultural production did not outpace population growth during the 1960s and 1970s, which left per capita food consumption stagnant.

Second, in this author's opinion, the Chinese leadership under Deng had taken a deliberate strategy to reduce the anticipated risk that reform might cause politically and economically. They chose agriculture as the first area to begin the reform experiments, because agriculture accounted only less than one third of National Income in 1978 (Almanac of China's Economy, 1994), and less than one fifth in big cities, such as Beijing, Tianjing and Shanghai. There was very limited state ownership in the area of agriculture. Most peasants in China were poor. They were more dispersed geographically, and less sophisticated technologically, culturally, economically and politically. It is not clear whether the decisionmakers were sympathetic to the peasants' objectives, or the peasants aided the achievement of the policymakers' goals. Nevertheless, the peasants in the countryside hardly threatened the achievement of those goals. As a result, agriculture was Deng's first effort at reform.

In 1979, the leadership began the system transition from the collective commune to the "household responsibility." The collective owned land was leased to families, who signed delivery contracts with the government. Hence, the peasants obtained a kind of real autonomy in the management and performance of their work. This new system

gained a considerable degree of legitimacy, because of dramatically increasing production. It was also stimulated by increased state purchasing prices for agricultural products. Subsequently, peasants' pressure forced ever more rapid decollectivization. As a result, the commune system was eliminated altogether in 1984. There was a record harvest that year (Lin, Burcroff II and Feder, 1993). The new arrangement is called "Bao Chan Dao Hu," i.e., Household Responsibility System (HRS). In HRS, land is assigned on the basis of fifteen-year leases, sometimes longer, with rent paid to the state as specified in contracts. The households kept whatever was produced above and beyond the contracted amounts. They could consume or sell the surplus on the free market. In 1985, the state canceled all mandatory deliveries, and set higher prices for goods sold above those quotas.

The agricultural reforms brought a strong growth of production and income in the countryside. Under the control of local authorities, the rural private and "collective" industry sector absorbed largely the excess labor cast free by decollectivization. By 1988 67 million people were employed in rural industry. Its rapid expansion partially explains the increase (and the destabilization) of overall growth during the 1980s (Woo, 1991). Meanwhile, the reforms also had their negative effects, such as damage to the environmental infrastructure and health, social polarization, and a less-effective policy of birth control.

In the second half of the 1980s, the central government had trouble achieving efficient "macroregulation," a Chinese term, referring to methods employed to maintain administrative control of agricultural reform. The local and regional authorities, taking

advantage of their reinforced power in fiscal and budgetary matters, caused overinvestment and the overheating of the economy (Kim, 1994).

The growing macroeconomic pressure led to an inflationary thrust at an increased rate of accumulation. After the strong a inflationary push in 1985-1987, by the end of 1988 the government pursued a policy of strict austerity. Following the 1989 massacre in Tiananmen Square, there was a freeze on reform. Nevertheless, after ten years of reform in the Chinese economy, many changes were irreversible (Chavance, 1994).

# CHAPTER THREE

# CHINA, 1949-1993, THE POLITICS AND ECONOMICS OF EVOLUTION IN FOOD AND AGRICULTURAL MARKETS

The historic analysis in Chapter Two of the reform process in three countries shows that the transitions from socialist economies follow different national paths, illustrating what is called "path-dependency." According to Chavance (1994), the way an economy is structured or changes is deeply influenced by its unique, earlier evolution, both recent and long ago. Thus, the transformation of a socialist economy is the result of many factors. Among these are (1) complex interactions among the initial systemic and social conditions, (2) strategic or political decisions made by the government or organized social forces, (3) unexpected events, (4) the behavioral adaptation of economic agents, and (5) institutional innovations and imitations.

As noted, reforms in the former Union of Soviet Socialist Republics (USSR) and East European countries emphasized political aspects and concentrated on industrial

areas. In contrast, China's reform has its deliberate strategy of limiting political change that could undermine the central regime's political control and legitimacy. Besides, China's reform oriented from economic pragmatism, and initially emphasized agricultural areas. First, the commune systems were transformed into the household responsibility system. Next, the development of townships was encouraged. Finally, the most difficult issue of reforming the state-owned enterprises in cities was begun (Ma, 1995). The expansion of the private sector over the past fifteen years has produced considerable change.

This study attempts to explain the Chinese case by focusing on price reform in the food and agriculture markets. It also takes into account the impact of strong growth energized by the pragmatic and economic reforms in agriculture, because food production has always been of crucial importance to political and social stability of China throughout its thousands of years of history.

According to Kondonassis (1991), ideally, balanced growth and consequently the simultaneous development of agriculture and industry are desirable goals. In practical terms, however, since most developing economies are characterized by an inadequate resource base, and low absorptive capacity, balance may not be possible at least in the early stages of development. From this point of view, whether a country should choose to emphasize agricultural or industrial development depends on its resources, technology, institutional characteristics, and balance between rural and urban populations. However, one thing is relatively certain--no matter which is chosen for emphasis, agriculture cannot be totally neglected. Several development experts

(Johnston, 1961; Kuznets, 1965; Myers, 1986) have argued that rising productivity in agriculture is a necessary prerequisite to a successful industrialization.

There are several possible benefits to a productive agriculture. As Kuznets (1965) suggests these may be market and factor contributions. When one sector provides a market for the other there is a market contribution. When one factor contributes a resource to another there is a factor contribution. Kondonassis (1991) summarized them as follows:

1. Food for the rising urban population.
2. Foreign exchange because of agricultural.
3. Conservation of foreign exchange because of import substitution of agricultural products.
4. Saving to the urban sector and tax revenue to the government for infrastructure because of rising agricultural income.
5. Increased demand for industrial products because of higher agricultural incomes.
6. Labor released from agriculture to the industrial sector because of rising agricultural productivity.

**Background of Price Settings**

In order to ensure industrialization in the Soviet Union in the 1930s, Stalin set the prices of industry's essentials (raw materials, fuel, power, transportation, and communication services) at levels lower than its output prices. Profits from industry thus could be plugged back into investment to increase capacity. To offer everyone

theoretically the basics of food, clothing, and shelter, consumers' essentials were subsidized, because of low wages (Chavance, 1994). In the 1950s, China under Mao adopted the Soviet relative price system for the same development strategy. Most prices in China did not change by a fen in twenty-five years (a fen is worth about one-eighth of a U.S. cent).

As noted, commodity prices are distorted in centrally planned economies. In China, the price distortion problems before the 1978 reform stemmed from Mao's development strategy. The post-reform problems also have their roots in the early development strategy.

At the founding of the People's Republic of China in 1949, the Chinese government inherited a war-torn economy in which about 90% of the population lived in countryside. Industry accounted less than thirteen percent share of national income (SSB, 1987). In order to strengthen national power, in 1952 China adopted a heavy-industry oriented development strategy. The goal was to build as rapidly as possible the country's capacity to produce capital goods and military materials (Lin, Burcroff II and Feder, 1993).

Capital was extremely scarce at that time to finance the desired high rate of investment in heavy industry. To facilitate rapid capital expansion, a policy of low wages for industrial workers evolved alongside the heavy-industry-oriented development strategy. The assumption was that through low wages, the state-owned enterprises would be able to create large profits and reinvest the profits into infrastructure and capital construction. The practice of establishing low prices for

energy, transportation, and other raw materials, such as cotton, was instituted for the same reason. Two other policies instituted to facilitate the rapid expansion of heavy industry were low interest rates and an overvalued exchange rate (Johnson, 1989).

According to Lin and others (1993), to implement the policy of low wages, the government was required to provide urban dwellers with inexpensive food and other necessities, including housing, medical care, and clothing. A strict food rationing system of edible oils, pork, grain and sugar was instituted in 1953, and has been in effect ever since.

**The Politics and Economics of Evolution**

In order to propose an effective analysis for price reform in food and agricultural

markets, this study is going to reexamine the first principles on which the Chinese economy was founded. To examine these first principles we have to look critically at the tenets of socialism, economic development and agriculture. To chart the paths for reform in China, it is important to know whether, as well as how far, these tenets are compatible with the Chinese condition (Woo, 1991).

China is at once a socialist country, a nation and a predominantly agricultural economy. Although agriculture accounted for only 25% of GNP in 1993 (down from 58% in 1952), 72% of China's total labor force engaged in agricultural production. With a population of more than 1.2 billion or 28% of world's population, China has only 7% of the world's arable land. Thus the importance of agricultural development in

China can hardly be over emphasized. In this regard, it is imperative that this study look at the path of agricultural development and the kind of strategies employed for agricultural development in China.

**Collectivization of Agriculture under Mao: 1950-76**

Being part of the socialist system, China's agriculture took on standard socialist features. It also uses the socialist instruments of economic development, such as the egalitarian, collectivist approach and the reliance on planning and central direction (Woo, 1991). In spite of their lip service to the importance of agriculture, Chinese have seen agriculture only as a tributary to the economy. They thought the agriculture sector would eventually decline in importance as China became industrialized. This thought persisted throughout various periods of Mao's regime for each of the specific approaches or organizational strategies adopted.

In 1950 the stage was set for a system of socialist agriculture with land reform. The 1950s land reform aimed at destroying the traditional order in the countryside and replacing it with a new collectivist system. It coincided with the unfolding of the First Five-Year Plan (1953-1957). Characteristic of the Stalinist approach, the plan gave top investment priority to industry, which received more than half of total national investment. Only about eight percent of the budget was given to agriculture (SSB 1994, the average from 1978-93 is 9.4%). However, agriculture received much organizational attention. Impetus was given to the collectivization of agriculture, because Mao believed that collectivization was a precondition for agricultural modernization. Thus, within a span of five years, China's rural population was

organized from individual peasants into members of some 753,000 advanced cooperatives' farms, with 119 million member households (Luo, 1985).

Table 3.1 Population, Agricultural Output, Grain Output, and Grain Trade in China: 1952-93

| Year | Population (million) | Year-to-Year Population Change | Agri. Output (1952 = 100) | Grain Output (million tons) | Year-to-Year Grain Output Change | Net Grain Trade (million tons) |
|---|---|---|---|---|---|---|
| 1952 | 575 | —— | 100 | 164 | —— | 1.5 |
| 1953 | 588 | 2% | 103 | 167 | 2% | 1.8 |
| 1954 | 603 | 3% | 107 | 170 | 2% | 1.7 |
| 1955 | 615 | 2% | 115 | 184 | 9% | 0.1 |
| 1956 | 628 | 2% | 121 | 193 | 5% | 2.0 |
| 1957 | 647 | 3% | 125 | 195 | 1% | 2.5 |
| 1958 | 660 | 2% | 128 | 200 | 3% | 1.9 |
| 1959 | 672 | 2% | 110 | 170 | -15% | 2.7 |
| 1960 | 662 | -2% | 96 | 144 | -16% | 4.2 |
| 1961 | 659 | -1% | 94 | 148 | 3% | 2.7 |
| 1962 | 673 | 2% | 100 | 160 | 9% | -4.5 |
| 1963 | 692 | 3% | 112 | 170 | 6% | -3.9 |
| 1964 | 705 | 2% | 127 | 188 | 10% | -4.5 |
| 1965 | 725 | 3% | 137 | 195 | 4% | -4.7 |
| 1966 | 745 | 3% | 149 | 214 | 10% | -4.0 |
| 1967 | 764 | 3% | 151 | 218 | 2% | -3.6 |
| 1968 | 785 | 3% | 148 | 209 | -4% | -1.7 |
| 1969 | 807 | 3% | 149 | 211 | 1% | -2.0 |
| 1970 | 830 | 3% | 166 | 240 | 14% | -1.0 |
| 1971 | 852 | 3% | 171 | 250 | 4% | -3.2 |
| 1972 | 872 | 2% | 170 | 241 | -4% | -0.6 |
| 1973 | 892 | 2% | 184 | 265 | 10% | -1.8 |
| 1974 | 909 | 2% | 190 | 275 | 4% | -4.2 |
| 1975 | 924 | 2% | 196 | 285 | 3% | -4.5 |
| 1976 | 937 | 1% | 195 | 296 | 4% | -0.9 |
| 1977 | 950 | 1% | 194 | 283 | -5% | -0.6 |

Source : SSB

**Table 3.1 Population, Agricultural Output, Grain Output, and Grain Trade in China: 1952-93(Continued)**

| Year | Population (million) | Year-to-Year Population Change | Agri. Output (1952 = 100) | Grain Output (million tons) | Year-to-Year Grain Output Change | Net Grain Trade (million tons) |
|---|---|---|---|---|---|---|
| 1978 | 963 | 1% | 210 | 305 | 8% | -5.7 |
| 1979 | 975 | 1% | 226 | 332 | 9% | -7.0 |
| 1980 | 987 | 1% | 229 | 321 | -4% | -10.7 |
| 1981 | 1001 | 1% | 244 | 325 | 1% | -11.8 |
| 1982 | 1016 | 2% | 272 | 355 | 9% | -13.6 |
| 1983 | 1028 | 1% | 293 | 387 | 9% | -14.9 |
| 1984 | 1039 | 1% | 329 | 407 | 5% | -11.5 |
| 1985 | 1050 | 1% | 340 | 379 | -7% | -7.2 |
| 1986 | 1065 | 1% | 351 | 392 | 3% | 1.2 |
| 1987 | 1081 | 1% | 372 | 403 | 3% | -0.1 |
| 1988 | 1110 | 3% | 386 | 394 | -2% | -8.9 |
| 1989 | 1127 | 2% | 398 | 408 | 3% | |
| 1990 | 1143 | 1% | 428 | 446 | 10% | |
| 1991 | 1158 | 1% | 444 | 435 | -2% | |
| 1992 | 1172 | 1% | 473 | 443 | 2% | -11.8 |
| 1993 | 1185 | 1% | 509 | 457 | 3% | -7.5 |

Source : SSB

Collectivization was surprisingly successful in the initial stage. It met with no active resistance from the peasants and was carried out relatively smoothly. The gross value of agriculture (in constant prices of 1952) increased about twenty-eight percent and grain output increased almost twenty-two percent from 1952 to 1958 (see table 3.1, columns 2 and 3).

According to Lin and others (1993), this experience greatly encouraged the leadership within the Party and led them to take a bolder approach. The "People's Commune," which consisted of about 30 collectives of 150 households was created in the fall of 1958. Within three months, 753,000 collective farms were transformed into 24,000 communes, which comprised 120 million households, over 99 percent of total households in countryside. The average size of a commune was about 5,000 households with 10,000 laborers and 10,000 acres of cultivated land. Payment in the commune was made according to subsistence needs and partly according to the work performed. Work on private plots was prohibited. Billions of man-days were mobilized as expected.

According to Woo (1991), collectivization in agriculture had its benefits. Along with those mentioned in Chapter Two, it laid the foundation for an egalitarian society the implementation of which helped China avoid the serious problems of polarization faced by many other developing economies. Moreover, the command structure of collective agriculture enabled it to pool resources for projects needed to protect peasants from major natural hazards--such as flood control, pest control, and water projects. As a result of collectivization, great improvements in irrigation and drainage were made. The irrigated area expanded at an average rate of slightly over one million hectares per year (SSB, 1994).

Because agriculture was thought of as tributary, in 1953 China imposed the producer levy system, a system of compulsory deliveries at fixed prices. This was

followed by a system of coupon rationing to distribute state-procured cereals and vegetable oils to the urban populations. The effects on agriculture were negative. The peasants began to subsidize the urban population, because government procurement policies invariably tended to lower the prices received by the peasants (Chao, 1970). The free markets and interregional trade were no longer allowed by the monopoly of the Ministry of Grain & Food and its local agencies. Grain growers were prohibited from privately selling raw or processed grain. In addition, peasants were not allowed to move from one place to another freely.

The Great Leap Forward (1958-1960) described in Chapter Two illustrates the shortcomings and inertia of the collective system clearly. When the farming population is operating below the subsistence level, collectivist ideology can be used to motivate peasants. That motivation cannot last long due to the limited persuasive power of the collective system. The period that followed was one of recovery and adjustment (1961-1965). It was directed by Liu Shaoqui, the country's president and vice-chairman of the party. He emphasized the role of material incentives as opposed to the ideological purism of Mao. After this brief period of policies aimed at stimulating economic growth, the Cultural Revolution and its aftermath (1966-1976) again wreaked havoc with the economy. Ideology was injected into economic planning. Foreign trade was disrupted, and educational training facilities were virtually shut down. In 1976 the national economy was on the edge of collapse. After the death of Mao and the arrest of the Gang of Four, Deng Xiaoping gradually established his new government and policies. He sharply reduced the

role of ideology in Chinese policy. The stage was set for a more pragmatic look at the political and economic problems facing the country.

**Agricultural Reform under Deng Xiaoping: 1979-93**

Under Deng's leadership, policymakers began to recognize the crisis in the economy as well as the stifling effects of the command system on productivity. The stage was set for a reform. The most striking accomplishment under Deng Xiaoping occurred in the agricultural sector. In late 1978 the Central Committee approved the progressive decollectivization of agriculture (Lin, Burcroff II, and Feder 1993).

The Third Plenum of the Eleventh Central Committee in December 1978 was the turning point. The agriculture related decisions of the Third Plenum consisted of (1) raising agricultural product prices (grain quota procurement prices went up twenty percent from the summer harvest of 1979), (2) forbidding higher authorities from intervening in the decisions of commune subunits (especially the production teams), and (3) permitting contracting for outputs with small groups within the production teams. Subsequent policy changes of importance included raising the limit on the size of private plots. In late September 1980, the Central Committee issued Document 75, which permitted almost unconditionally the contracting of output with the household. Thus, the Document 75 ended the commune as a composite unit combining political and economic authority. Within three years, the household was almost completely restored as the basic unit of production in agriculture (Griffin, 1984).

At the beginning of the reforms, the government did not intend to change the collective system to the household responsibility system (HRS). The HRS grew from involving only one percent of peasants in 1979 to ninety-nine percent in 1987. The whole process of re-establishing the HRS went through three stages.

First, the means of production, such as draft animals, tools, and equipment, were divided among households, while the government retained the power to set sales quotas and tax obligations. After meeting its sales and tax obligations, the household was free to dispose of its surplus. They could sell the surplus to the state at above-quota prices, higher "negotiated prices," or in the free market. Thus, an increase in productivity would result in a higher increase in income for the household.

In 1983, Document Number 1 rendered the second stage of reform. The household was allowed to freely hire labor, to buy its own motor vehicles and farm machinery, and to market its surplus product, i.e., what was above state quotas, across administrative boundaries. The new system gained a considerable degree of legitimacy by dramatically increasing production, which was stimulated as well by increased state prices for agricultural products (Hartland-Thunberg, 1989). Then, peasant pressure forced ever more rapid reform. The commune system was eliminated altogether in 1983 and 1984. After a record harvest in 1984, the state canceled all mandatory deliveries, and increased prices for goods sold above quotas in 1985 (Woo, 1991).

These reforms were further consolidated with Document Number 1 in 1984. It essentially permitted a more market oriented system in agriculture. Legislation permitted lease arrangements between households and the government that allowed

concentration of land in the hands of the more efficient households. To consolidate the peasant's incentive to properly use land, contracts between households and the government were lengthened to more than 15 years. As households became free to lease their land, peasants were, in turn, free to choose their occupations and to go after what they perceived as better work opportunities. A class of peasant entrepreneurs thus sprang up, engaging itself vigorously in a multiplicity of rural enterprise. They became employed in various types of nonfarm work, such as industry, construction, transport, commerce and services. Consequently, within fifteen years, "peasant capitalism" entirely replaced the collectivist system, and became the dominant model of rural organization and production. These rural enterprises were made possible after agrarian villages were permitted to engage in non-agricultural activities.

The results of these changes were impressive. Agricultural output increased at an annual rate of six percent in 1979-93. Nongrain crops' annual growth rate was thirteen percent and nine percent for 1980-1982 and 1982-1986 respectively. Animal husbandry grew at ten percent annual rate throughout 1980-1982. Above all, the growth rate of subsidiary agricultural products' output and rural industries registered 40% and 43% respectively in 1982 and 1986 (Perkins, 1988). From 1980 to 1986 grain output grew at a slow annual rate of about 3%. This increase was achieved in spite of a 10% annual drop in the acreage sown.

The rural industries, through the operation of both vertical and horizontal linkages, gradually developed solid bases. Output from these rural industries gradually made its way into the urban industrial system. While foreign trade also played a part,

the principal source of competition for the urban industrial system came from these non-state owned rural industries. These town and village enterprises (TVEs) competed vigorously not only with each other but also with state industry and with suppliers from foreign markets (World Bank, Trade and Development Report 1993). The price system of the rural industries, which was essentially determined by the free market took the lead in reducing the irrationality of the urban system. As integration of the two systems took place, competition further moved their respective price structures toward a common, rational level. These external stimuli, led to further reforms in the urban industrial system, such as, allowing bankruptcies and labor mobility, as well as de-scaling and decentralization. It was this success that gave Chinese leaders both the will power and the political capital to launch subsequently a large-scale reform of the urban industries.

Within agriculture, further reforms continued. At the beginning of 1985, Zhao Ziyang announced the phasing out of mandatory quotas. Prices of all agricultural products, except for grain and cotton, were to be set by market forces. In the case of grain and cotton, the state would contract to buy smaller quantities than before, leaving the farmers more freedom to sell in the market. Equally important, this measure also intended to reduce the heavy grain subsidy the state had been incurring, which amounted to about 5.7% of total government expenditures in 1993 (down from 9% in 1980; SSB 1994).

Table 3.2. Agricultural Production and Chinese Peasant Income 1978-1993 (in millions of tons)

| Year | Grains | Cotton | Oil Seeds | Red Meat | Foreign Exchange Rate(¥/$) | Per Capital Income(¥) | Per Capita Income[1] |
|---|---|---|---|---|---|---|---|
| 1978 | 305 | 2.2 | 5 | 9 | 1.577 | 133 | 100 |
| 1979 | | | | | | | |
| 1980 | 321 | 2.7 | 8 | 12 | 1.53 | 191 | 135 |
| 1981 | | | | | | | |
| 1982 | | | | | | | |
| 1983 | 387 | 4.6 | 11 | 14 | 1.993 | | |
| 1984 | 407 | 6.3 | 12 | 15 | 2.796 | | |
| 1985 | 379 | 4.1 | 16 | 18 | 3.201 | 398 | 249 |
| 1986 | 392 | 3.5 | 15 | 19 | 3.722 | | |
| 1987 | 403 | 4.2 | 15 | 20 | 3.722 | | |
| 1988 | 394 | 4.1 | 13 | 22 | 3.722 | | |
| 1989 | 408 | 3.8 | 13 | 23 | 4.722 | 602 | 269 |
| 1990 | 446 | 4.5 | 16 | 25 | 5.222 | 686 | 295 |
| 1991 | 435 | 5.7 | 16 | 27 | 5.434 | 709 | 264 |
| 1992 | 443 | 4.5 | 16 | 29 | 5.752 | 784 | 245 |
| 1993 | 457 | 3.7 | 18 | 32 | 5.800 | 922 | 198 |

1. In real terms

Source: SSB, 1994 & International Financial Statistics Yearbooks (IMF Statistics Department).

The reforms were highly successful. National income, agricultural and industrial output all grew annually at 10% compound rates during the 1979-93 period (SSB, 1994). Peasants' annual per capita net income increased from ¥133 in 1978 to ¥922 in 1993 (see column 6 in table 3.2). Rural industries boomed, its output accounted as 273% of agricultural output in 1993 (SSB, 1994). It also helped absorb surplus labor in rural areas.

**The Price Reform**

After a series of experiments beginning in 1979, on 20 October 1984, the Central Committee announced that price reform was "the key to reforming the entire economic structure." It was written in a document entitled "Decision of the Central Committee on Reform of the Economic Structure" (Arthur, 1988). By late 1984, the reformers finally decided the pace and mode of price reforms. They chose to follow Hungary's three-tiered price system: (1) fixed prices for the most important goods, (2) upper and lower limits to exports fluctuations for an intermediate range of goods, and (3) freely floating prices for a host of consumer and small-producers' goods.

Similarly, substantial progress was made in agriculture with respect to the condition that prices must reflect relative scarcities. The authorities adopted a dual price system where contracted agricultural output was sold at quota price fixed by the state, while goods produced in excess of quota were traded at negotiated or market prices. As more and more agricultural goods were channeled through the market, the market portion of goods under the dual price system behaved increasingly like that with freely determined prices. By 1985, many food prices, including the prices of meat, poultry, fish and vegetables, had been decontrolled. Since mid-1991, the Government has taken advantage of a period of price stability to raise state prices for grain and coal more closely to market levels (World Bank, Trade and Development Report 1993).

**Obstacles for Sustaining Agricultural Development**

The agricultural reform was undoubtedly a success. The policymakers neglected to note that the success in agriculture was due in part to the legacy handed down by the collective system in the past, which had cleared away institutional obstacles against a more rational distribution of land and means of production. The collective system had provided a more equitable access to material inputs such as seeds and fertilizers, and more equal selling rights to the official collection/distribution agency. It also permitted easier dissemination of technological information (Greenshields, and Bellamy, eds. 1986).

Since 1985, agriculture has been contributing importantly to the growth of the national output, but it has received annually only about eight percent of government expenditures (SSB, 1994). As a result, the rural infrastructure has been depleted at a much faster rate than it has been replenished. In many areas irrigation works and their maintenance received inadequate attention. The amount of irrigated area fell from 1978 to 1989 (SSB, 1994). According to Du (1985), the development of the agriculture would require an investment level of ¥1,000-1,500 billion between 1985 and the year 2000, if it were to sustain its then-prevailing rate of development. However, the amount that was allocated by the state between 1985 and 1993 was about 2% of this estimate (SSB, 1994).

There were surplus funds in the agricultural sector in the hands of private households or in the banking system, but these funds were being used largely for investment in the nonagricultural sector, namely the rural industries, commerce and

fixed deposits. The number of rural households with a banking account increased from 5.6 million in 1978 to 357.6 million in 1993. The money in fixed deposits increased more than 37 times, from ¥7.6 billion in 1980 to ¥284.5 billion in 1993 (SSB, 1994).

The obstacles for sustaining agricultural development came largely from the disproportional growth of the nonagricultural sector. According to Woo (1991), these obstacles were multidimensional. First, manufactures, especially consumption goods industries, fulfilled latent demands that had been suppressed before the reform, and hence stood to profit easily. As a result, they received more funding from the local banking system. Consequently, long-term investments in agriculture were ignored. Second, as industry was able to generate quick and large profits, because of a now unbridled aspiration for consumption. This sucked more resources and funds out of agriculture. Third, the peasants who moved off their land were no longer inclined to go back, except in extreme cases. They tied their fates to the business cycle of the urban industrial system and shared its ups and downs (Portes, 1989). This increased the problem of unemployment in the nonagricultural sector, which always had been more of a problem than in the agricultural sector. Creation of employment in the countryside needed much less physical and human capital.

There were also institutional disjunction that resulted from the rapid system changes. These included (1) the destruction of collective property; (2) an enhanced sense of insecurity among some of the peasants, (3) an increased rural birth rate that might due to the demand for household labor; and (4) increased polarization in income among different households and regions (Riskin, 1987). Erosion of soil caused by the

reckless felling of trees and the clearing of forests for fuel or building materials also contributed to the environmental degradation of the countryside.

Thus, since 1988 there are increasing obstacles to sustaining agricultural development. In 1993, cotton production dropped to 3.7 million tons, but in 1984, total recovered to reach 6.3 million tons. The stagnation was temporarily compensated by growths in other agricultural goods and the nonagricultural sector, until the weaknesses of the agricultural reform were thrown open and compounded by the setbacks in the urban industrial reform.

The troubles resumed as inflation began to climb in the city starting in 1987 (SSB, 1994), caused by a period of sustained economic expansion across the nation that was backed up by strong credit contraction. The escalating inflation reduced. However, the real income of urban workers and their effective demand led to shortages and hoarding of materials in the industries, raising the cost of essential inputs to agriculture, notably chemical fertilizers.

One result of the credit contraction was that some provinces found themselves in shortage of money to procure grain from farmers. They were compelled to issue the farmers IOUs. Another result was that the nonfarm sector, which depended on credit available from local banks, had to throw thousands of people out of jobs. The negative impacts of these obstacles on agricultural development began to unfold in 1987 (Woo, 1991). Agricultural output stagnated. The acreage sown in 1993 (95 million hectares) fell below the 1978 level (99 million hectares). Besides the increase in grain imports,

the 10 million tons of fertilizers imported in 1993 was double the level of those registered in 1986 (SSB, 1994).

In response to cost increases, reduced demand, and uncertainty caused by the issue of IOUs, the behavior of farmers is undergoing change. The issuing of IOUs for forthcoming harvests certainly reduced the production incentive for the farmers (Woo, 1991). Besides, the Chinese government agencies were not able to honor their commitments to supply fertilizers at stipulated prices and to make timely preproduction deposits to the farmers. As a medium-term consequence, the rational farmer, in response to the lack of inputs, financing and the uncertainty of payment, cut back production.

In order to reduce issuing IOUs, and to be able to pay for its procurement, the government has had to resort to printing money. To a cash hungry government, the temptation to do so is irresistible. Unfortunately, the consequence of printing money is even more inflation. Farmers, who come to realize that they receive deflated values for their crops, will resist fulfilling the full quota that is imposed on them. The result is that the government must raise the procurement price, which will send its budget further into the red, or it will have to apply some kind of coercion. The former may help for a while, but will likely generate resistance, for the average farmer is no longer the same submissive person that he was under Mao's regime. The taste of prosperity and freedom has made him too individualistic to accept blind coercion. The result of the above developments is that the overall level for procurement is declining.

To combat this situation, the government considered recentralizing the agricultural sector, but clearly it is no longer practical to do so. At any rate, inadequate procurement and the subsequent shortage of food for distribution to the cities, coupled with rising prices in the free market, made the already discontented urban workers panic. In the second half of 1993, rationing had to be reinstituted in a few cities.

**Does China's Reform Strategy Make Sense?**

Economists disagree substantially in their prescriptions for China's reform. Some economists, notably Milton Friedman, prescribe a monetary approach (Friedman, 1990). They believe that the difficulties experienced in the later days of Zhao was due to the joint effects of a liberal credit expansion and the irrational price regime. As a result, their solution consists of a restriction in the money supply with a comprehensive lifting of price controls. While such a heavy dose would doubtlessly work, if given sufficient time, this solution is not politically palatable. The Chinese government, keen on preserving its power, would not to bear the political consequences of the inflationary pressures that might be unleashed by a wholesale price decontrol.

In mid-1988, in a desperate attempt to wipe out irrational pricing, Deng strongly expressed his will to back a price decontrol program . Shortly after his strong statement, he quietly reversed this policy. The political risks of the escalating inflation that accompanied price decontrol were too formidable even for a political figure as powerful as Deng (Woo, 1991). Thus, it is evident that serious challenges continue for the Chinese government in the agricultural sector.

Nevertheless, from this author's point of view, the pragmatic and economic reforms in agriculture were generally successful in that they raised the income of the peasants who compose more than 70% of the total labor force. The reforms also increased savings in the rural sector and tax revenues to the government for infrastructure. The per capita tax revenue in 1993 is 175 times that in 1980 (see Table 5.6, row 7). Finally, it stimulated demand for industrial products, which provided new opportunities for the more competitive enterprises. Rising agricultural productivity released labor from agriculture, entirely replaced collectivism with "peasant capitalism", and increased food supply for the rising urban population. In conclusion, agricultural price reform increased agricultural productivity and caused sustained strong overall economic growth in China. The agricultural reform changed the Soviet pricing system in the food and agriculture markets to create almost complete free market pricing in the food and agricultural markets. These markets, with their increasing capability to signal relative scarcities and opportunities, have become the chief guiding force for resource allocation.

# CHAPTER FOUR

# CONCEPTUAL MODEL, HYPOTHESES, AND REVIEW OF THE LITERATURE

In this chapter I describe the conceptual model, and relate it to the prices of consumer and producer commodities, which are the quantitative contribution of the research. This is an original approach. No other researcher has conducted this type of study of this area.

In the context of a brief review of the relevant literature, I develop testable hypotheses about price formation. I show how a present value model is used to model pricing in a transitional economy in an intuitively appealing and a quite powerful way.

## Review of the Literature

There are three major purposes for using prices: accounting, income distribution, and resource allocation. A particular form of political and economic systems, which occur in different historical development phases, determined what roles prices play in a society (Guo, 1992).

There are three forms of socialist economic systems: a heroic-enthusiastic economic system, a construction and consolidation of a bureaucratic-hierarchical

command economy, and a less centralized market socialism (Kornai, 1985). There are three patterns in socialist pricing and price reforms related to these three socialist economic systems. They are: (1) a revolutionary economy with a complete state price control, (2) a bureaucratic-hierarchical command economy with a high degree of price control and (3) a less centralized market economy with a partial price control (Guo, 1992).

**East European Experience**

A. Former Soviet Union

In the former Soviet Union, the pricing system began in a way described in pattern one above, when it was in the violent revolutionary period. During the 1920s the system changed to a pattern two type. The 1968 reforms and the post-1968 system can be thought as belonging to pattern three (Guo, 1992).

The central authorities used the Soviet pricing system as means of realizing planning goals (Bornstein, 1966). Prices were mainly used for distributing national income and accounting (Wilczynski, 1972). Producer prices were based on average production costs less rent and capital charges. Prices were kept unchanged for long periods -- five to fifteen years in some cases. Retail prices were only vaguely related to producer prices because they were set to adjust demand to planned supply to ensure equilibrium in the consumer goods market (Wilczynski, 1972).

The Soviet reformers criticized the traditional system because (1) prices of producer goods did not reflect their value, (2) the prices did not furnish correct signals to

planners and enterprise managers, and (3) the shortcomings of these prices impeded their effective use as a measurement for the control and evaluation of enterprise operations (Bornstein, and Fusfeld, 1970).

In 1968 a price reform took place. It was aimed at replacing the traditional "cost plus" formula of price-setting by a "production price" which involved a uniform (15%) rate of profit on capital for different commodities and industries (Yi, 1982). Some reformers expected that such a change would entail a 11 -12% increase in wholesale prices of industrial products (Bettelheim, 1978). The reformers believed that this proposal might solve the problem of disparities in industrial prices.

The newly formed State Price Committee (SPC), which was under the State Planning Commission price reform, conducted the price reform. The price system remained highly centralized in the post-reform period. The SPC itself fixed prices for important producer and consumer goods. These included 75-80% of the value of output of heavy industry and about 50% of the value of output of the light and food industries (Bornstein, 1970). In addition to SPC price-setting, price committees in local republics set prices covering nearly 20% of the value of output in heavy industry and over 40% of the consumer goods industry. Enterprises could set prices themselves only for goods not controlled by higher authorities (Bornstein, 1970).

Some of the Soviet economists considered the price reform unsuccessful because (1) prices still did not play a role in resource allocation (which was accomplished by quantitative directives), and (2) profitability was still not a criterion of enterprise

efficiency. The formula used for setting production prices remained cost-oriented and neglected demand as a basic element of value and price (Guo, 1992).

The goal of a uniform rate of profit on capital of 15% for all industrial departments was never achieved (Yi, 1982). Profit quota rates varied for a number of reasons. One reason was the problem posed by the mutual substitutability of certain products. Their prices had to be linked to adjust supply and demand. One such case was that of "fuel and power" products like coal and oil (Yi, 1982; Bettelheim, 1978). Since it was deemed necessary to keep certain prices stable, enforcing a uniform profit rate would have involved huge subsidies, and thus placed an impossible financial burden on the State (Yi, 1982).

The reform of producer prices carried out in Soviet industry did not simplify the conditions for price-setting. According to Xu Yi (1982), the lessons for China were, first, that a uniform rate of profit was not feasible in practice. Second, price reform should be aimed at attaining a rational ratio of profit rates for different industries. Xu Yi believed that the Soviet style price reform was not suitable for China, and Chinese economists such as Chen, Baoshun and Liang, Wuxia supported Xu Yi's view (Guo, 1992).

Russia began market reforms in 1992 after the collapse of Communism. The annual inflation rate reached 130 percent in 1995. Inflation fell steadily since February 1996, and the annual rate for 1996 was expected to be about 25 percent. Consumer prices actually fell in August 1996, the first drop since Russia began its market reform (The Daily Oklahoman, 09-05-96).

B. Yugoslavia

In Yugoslavia, the pricing system changed from Pattern One in the 1949-50 period to somewhere between Pattern Two and Pattern Three in the 1950-65 period, and then to Pattern Three type post-1965 (Guo, 1992). In the 1950s, Yugoslavia abolished the Soviet type of state administrative management rooted in the complementary principles of debureaucratization and mass participation (Prout, 1985). These two principles constituted the ideological basis of the reformed Yugoslavia market socialism. The system of self-managed enterprises embodying the concept of "worker collectives," "social-owned industrial assets," and "surplus value accounting" was established. At that prices and foreign exchange controls were also relaxed. Yugoslavia became in theory a market-oriented country relying mainly on the market mechanism (Prout, 1985; Milenkoritch, 1971).

The reform was designed to allow most prices to be determined according to supply and demand. However, due to the severe inflationary pressures that afflicted the economy, the policy was not carried out. The state was forced to control or supervise 80% of industrial producer prices, and most important commercial and agricultural prices (Lu, 1983).

There were three concerns that the Chinese economists in both the State Price Bureau and the People's University of China thought the Yugoslav case was also inappropriate for China. First, it could cause a serious inflation problem. Second, it required an immense number of meetings between sellers and buyers. Lu Nan (1983) indicates that there were more than 240,000 people attending price negotiation meetings

in Yugoslavia each day in 1985. Third, implementation of such a system would shatter the power of the central government. The first and third concerns were the main reasons for the Chinese decision not to accept such a system (Guo, 1992).

C. Hungary

One of the conclusions of the Hungarian debate on the pricing system was that "in an administrative system the rational orientating function of prices can assert itself only to a very limited extent" (Csikos-Nagy, 1971). Price reform in Hungary focused on the issue of what functions the price system should perform, rather than by what formulae prices should be determined (as in the Soviet Union), or who should set the prices (as in Yugoslavia). The Hungarian reform's goal was to allow the market mechanism to determine some prices rather than using administrative methods to set all prices (Csikos-Nagy, 1971).

Further price reform, aimed at adjusting domestic prices to world market prices, occurred in 1985. A new system of "real competitive market prices" was put into practice. However, some problems arose in the Hungarian experience. Since competitive prices were adjusted to world markets, prices became more vulnerable to the world market situation. In 1973, for example, Hungary suffered heavy economic losses due to the explosion in international oil prices (Csikos-Nagy, 1979). Another problem was the continuing deviation of producer prices from the retail prices in the post-reform period. When the State tried to adjust these two kinds of prices into a more rational relationship, the price level increased significantly and intensified the problem of inflation (Lu, 1983).

D. Summary of the East European Experience

Three different patterns of price formation and reform resulted in three different types of pricing. First was the centralized pricing system in the Soviet Union, the German Democratic Republic, Czechoslovakia, Bulgaria and Romania. Second was a hybrid system in Hungary and Poland. Third was a relatively free pricing system in Yugoslavia (Lu, 1983). We should notice the difference in their fundamental methods of reform. Yugoslavia emphasized price determination by producers, and by negotiation between producers and consumers. Hungary put more emphasis on international pricing as an important criterion for price reform.

However, the above pricing systems suffered shortcomings. In the Soviet Union, Hungary and Yugoslavia, fixed prices diverged from social costs, because consumer demand was neglected, and differences in quality were not reflected in prices adequately. Moreover, state enterprises did not have strong response to price changes. There were widespread price differentiations in the Soviet Union and economic distortions in Hungary and Yugoslavia, and serious problems of inflation, especially in Yugoslavia.

The Chinese government, reviewing the East European experience, found the high rate of inflation entirely unacceptable. Vice Director Qiao, Rongzhang of the Price Research Institute of the State Price Bureau stated, "When inflation is as serious as in Yugoslavia, then it is not merely a problem of economy, but also of social and political factors. We would not like to follow their case and will try to avoid it in our reform" (Gou, 1992). Inflation was one of the most important concerns in the Chinese choice of

the direction and method on price reform. Thus, Chinese authorities declined to use the Yugoslavia model.

**China's Price Reform**

At the beginning of the reforms, the Chinese government originally intended the most important policy change was the adjustment of procurement prices for major crops (Woo, 1991). Announced at the end of 1978 and effective in 1979, quota prices for grain, oil crops, cotton, sugar crops, and pigs increased 17% on average. In addition, the premium paid to the above-quota delivery of grain, oil crops and cotton was raised by 30% to 50% above the quota prices. The average increase in the state procurement prices for grain was 22%. However, if we only consider the marginal prices, that is the quota prices and above-quota prices, the increase in the state procurement prices is 41% (SSB, 1988)

Corresponding to the increase in procurement prices, retail prices were raised more than 30% for pork, eggs and fish in 1979, but for basic necessities, such as grain and edible oils, retail prices were not changed. To compensate for the rise in retail prices of pork, eggs and fish, each urban dweller was paid ¥5 to ¥8 a month. Therefore, as subsequent prices increased, the government's subsidies also had to increase. Price subsidies increased from ¥9.4 billion, 8.4% of the national budget in 1979, to ¥37 billion, 24.6% of national budget, in 1984 (SSB, 1988). As a way of reducing the state's burden and increasing the role of markets, mandatory procurement quotas were abolished (for cotton in 1984 and for grain in 1985). They were replaced by procurement contracts to be

negotiated between the government and the farmers. The contract price was a weighted average of the basic quota price and above-quota price. This change resulted in a 9.2% reduction in the price paid to farmers. The reduction caused the decline of grain and cotton production in 1985, and so the contracts were made mandatory again in 1986 (Stone, 1988). It was not clear that whether price reform might have as dramatic an impact on total productivity as institutional reform, but it might have a strong impact on output growth. Higher output prices might induce farmers to increase inputs, and vise versa.

**The Basic Conceptual Model**

There are many studies on price reform. Most of them use neoclassical economic approach. They posit that under perfect competition a firm would incorporate observable input price changes immediately and completely pass them into the output price. A quantitative estimation of the relationship between the change in input price and the change in output price would be equal to one. That is 100% of the input price change could be passed through to the output price.

Garrett (1995) wrote it as a simple pricing model and assuming the marketing margin as an explicit additional component of the output price (Equation 4.1):

$$\Delta P^0 = \Delta P^i + \Delta M \qquad (4.1)$$

where $P^0$ = an output price,

$P^i$ = prices of inputs,

and M = the marketing margin.

Equation 4.1 says that if the prices of input change but the output price does not change by the same amount, the firm must be altering its marketing margin to absorb the difference. It is adjustment of the marketing margin that allows a firm to vary the speed and extent to which it passes through changes in input costs (Hooper, and Mann, 1989; and Mann, 1986).

For purposes of illustration, Garrett (1995) is using an accounting, not a neoclassical economic, definition of the marketing margin in the above equation. He argues that no matter what procedure a firm uses to determine the margin, equation 4.1 holds. The market margin is by his definition the difference between the costs of production (costs of tangible items) and the output price.

Generally, their econometric estimation of price transmission relies on an equation that relates the output price to input prices. Equation 4.2 presents the simple pricing model of Equation 4.1 as the econometric equation:

$$\Delta P^0 = \alpha_0 + \beta \Delta P^i + e \qquad (4.2)$$

where $P^0$ = the output price,

$P^i$ = the input price.

The estimated parameter in Equation 4.2, β, is the price transmission coefficient. It represents how much of the change in the input price is transmitted, or passed through to the output price. Note that the marketing margin had disappeared from the equation (Garrett, 1995).

The analysis present in this study attempts to go beyond this rather mechanistic approach, which is the margin determination. Instead a present value model of rational commodity pricing is used, this model accounts for the impact of economic fundamentals and the behavior of agents.

There are many theories of commodity price formation. On the one hand, we have Hotelling (1931) style models that predict systematic increases in real prices. These models are based on fundamentals such as supply, demand, and asset-holding decisions. They suggest that price movements are predictable.

On the other hand, we have Random Walk and Martingale Models of price formation that suggest that price changes are unpredictable. Briefly, if the current price is the expected value of the future price, the price sequence follows a Martingale process. This argument is usually adopted to explain the stochastic behavior of commodities prices. In the special case where a detailed specification of the economic conditions is made, such that the distribution of one-period returns repeat themselves through time, we obtain a Random Walk model

(Fama, 1970). Samuelson (1965) provided a proof that properly anticipated prices fluctuate randomly.

**The Model**[1]

Let { $p_t$ } represent a univariate data generating process for the spot price of the various agricultural prices. A martingale process is defined as a { $p_t$ } which satisfies $E(p_{t+1} | I_t) = p_t$, where E is the ordinary expectations operator, $p_t$ is the price at time t and $I_t$ is the information set reflected in market prices. An alternate representation of price movements, which does not assume that the expected value of the returns on an asset, is called the submartingale model (Agbeyegbe, 1993). Under the assumption that risk-neutral individuals arbitrage between commodities and a riskless asset yielding a constant positive return, commodities prices obey the submartingale:

$$E( p_{t+1} | I_t ) \geq p_t \tag{4.3}$$

and rewritten (4.3) as

$$E_t P_{t+1} = (1 + \mu)P_t - \psi_t \tag{4.4}$$

[1]. This model's deviation is closely followed Pindyck's (1993).

Equation 4.5 follows the difference relation of Equation 4.4[2]:

$$P_t = \delta \sum_{i=0}^{\infty} \delta^i E_t \psi_{t+i} \qquad (4.5)$$

Equation 4.5 is the present value model. It says that price, $P_t$, equals the sum of current and discounted expected future payoffs, or benefits, from ownership of the asset (Pindyck, 1993), where $\psi_t$ is the 1-period per unit net marginal convenience yield, i.e. the benefit flow from holding a marginal unit of the commodity from the beginning to the end of period t, net of storage and insurance costs. Let $\delta = 1/(1 + \mu)$, where $\mu$ is the commodity-specific 1-period discount rate, i.e. the expected rate of return an investor would require to hold a unit of the commodity. For the time being, we will assume that

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[2]. Note that (4.5) is the solution to the difference relation, $E_t P_{t+1} = (1 + \mu)P_t - \psi_t$. (4.4)

Let $\psi_t$ = unit payoff or benefit from ownership of the asset in period t. Solving $P_t$ from (4.4):

$$P_t = E_t P_{t+1} /(1 + \mu) + \psi_t/(1 + \mu)$$

$$= \delta E_t P_{t+1} + \delta\psi_t \qquad (4.4.1)$$

Since $E_t P_{t+i} = \delta^i E_t \psi_{t+1}$, and

$$E_t P_{t+i} = \sum_{i=0}^{\infty} \delta^i E_t \psi_{t+i} \qquad (4.4.2)$$

Then substituting (4.4.2) into (4.4.1):

$$P_t = \delta \sum_{i=1}^{\infty} \delta^i E_t \psi_{t+i} + \delta E_t \psi_t$$

$$= \delta \sum_{i=0}^{\infty} \delta^i E_t \psi_{t+i}$$

Q.E.D.

$\mu$ is constant, and can be written as $\mu = r + \rho$, where r is the risk free rate and $\rho$ is a risk premium.

Thus, the model explains changes in asset prices in terms of "fundamentals", i.e. changes in expected future payoffs ($\psi_{t+1}$) or discount rates ($\delta$). Most tests of the model have used data for stocks, where the payoffs are dividends, or bonds, where the payoffs are interest and principal payments (Pindyck, 1993).

This study explores the limit of the present value model by testing its ability to explain the pricing of agricultural commodities. The present value model is better than the neoclassical one for a number of reasons. First, the model is helpful in understanding price movements, and allows us to test the rationality of commodity pricing in a way that is very different from neoclassical tests. Second, these tests provide evidence of the robustness of the present value model. (If the model is valid, it should explain the pricing of any asset that yields a payoff stream.) Third, if the commodity is traded on a futures market, the model can be written entirely in terms of spot and future prices, and provides a parsimonious description of rational price dynamics (Pindyck, 1993).

For a storable commodity, the payoff stream $\psi_t$ is the convenience yield that accrues from holding inventories, i.e. the value of any benefits that inventories provide, including the ability to smooth production, avoid stockouts, and facilitate the scheduling of production and sales. Convenience yield is the reason that firms hold inventories, even when the expected capital gain is below the risk-adjusted rate, or negative.

The convenience yield that accrues to the owner of a commodity is directly analogous to the dividend on a stock. If the commodity is well defined and easily traded,

and if aggregate storage is always positive, the (4.5) always holds, and price must equal the present value of flow of expected future convenience yields. The present value model thus provides a compact explanation for changes in a commodity's price; they are due to changes in expected future convenience yields. We usually try to explain commodity price in terms of changes in current and future demand and supply, but changes in demand and supply in turn cause changes in current and expected future convenience yields. Hence the present value model can be viewed as a highly reduced form version of a dynamic supply and demand model (Pindyck, 1993).

Therefore, the conceptual approach taken here differs from the neoclassical one, and the conventional one as exemplified by Jian-Jong Guo (1992). Guo claims that during the post reform period, prices were adjusted continuously to reflect international prices, which many economists believe indicate the true cost (or benefit) of a resource to a nation's economy.

Substantial empirical evidence indicates that this belief is questionable (Corr, 1995). A well - known example is U.S. cotton export. For many years, U.S. government subsidized the cotton export, because the international cotton price was lower than U.S. domestic cotton price.

In addition, the above belief generally neglects the price setting behavior of governments. However, public policies can have a significant effect on how changes in international prices are passed through to domestic prices. For example, an exchange rate change that increases the cost of imported wheat may not be passed through to the cost of flour, if the government fixes domestic flour prices.

Agricultural economists have long noted that import demand elasticity for commodities must take government intervention into account, which may make home country producers less responsive to international price changes, (Roe, Shane, and Vo, 1986).

Although most studies do not consider government intervention in the pricing mechanisms, these examples make it clear that in many cases it is changeable government policy that determines the very nature of the impact of international prices (Garrett, 1995).

China's price reform is under an authoritarian regime. There are still restrictions on imports and foreign exchange rates, as well as consumer prices. Thus, I do not consider international prices explicitly.

**Economic Fundamentals: Demand and Supply Factors Affecting Pricing**

The brief review of the food and agriculture's roles in China's economy is incorporated into the broader discussion of the demand and supply factors that affect price formation. I do not attempt to provide an in-depth analysis of the food and agriculture's roles here for two reasons. First, practicing development economics during the last four decades has helped raise the status of agriculture among developing strategists. It has been found that an agricultural sector of rising productivity can be of strategic importance to the overall development effort and to industrial development (Kondonassis, 1991). Second, the primary purpose of this section is not to repeat these efforts, but to explore which economic fundamentals, i.e., demand and supply factors,

might affect price formation, and how they would do so. This research is an initial attempt to identify these factors and provide a quantitative assessment of how they affect price reform in China. Although conventional studies often mention certain factors as having an impact on the rate and magnitude of price reform, few studies have incorporated these factors directly into the theoretical or empirical model of China's context. Therefore, on this specific topic, there is very little literature to review.

This study attempts to examine two questions:

* How much of the change in demand and supply (DS) shows up in the commodity price (magnitude)?

* How fast does the commodity price change in response to the change in DS (rate, or speed)?

Demand and Supply (DS) Factors

DS factors influence price formation through their impact on the markets. To identify the DS factors important to pricing, we have to understand that agricultural development is a stepping stone to industrial development (Kondonassis, 1991). The experiences of Japan and Taiwan clearly illustrate how a strategy of high productivity in agriculture can be used as an effective approach to industrialization. We might also be able to learn some lesson from China's experiences below.

As noted in Chapter three, China under Mao adopted the Soviet's industrial development strategy in the 1950s. This strategy resulted in a great demand for agricultural products. First, urban population increased dramatically from 58 million in 1949, to 99 million in 1957 (SSB, 1988). Since the industrial strategy would not permit

the use of large amounts of scarce foreign reserves to import food for urban consumption, satisfying the increasing food demand in urban areas hinged on the growth of domestic grain production. Second, since the bulk of China's exports consisted of agricultural products, the country's capacity to import capital goods for industrialization depended on agriculture's growth. In 1953, agricultural products alone represented 56% of the total value of China's exports, with another 26% consisting of processed agricultural products. Until the mid-1970s, agricultural and processed agricultural products represented over 70% of the total value of exports (Almanac of China's Economy, 1987). Third, agriculture was the main source of raw materials for many industries, such as textiles and food processing. Agriculture, therefore, was clearly viewed as the bottleneck and major point of intervention in pursuing the overall economic development strategy in China in the early 1950s.

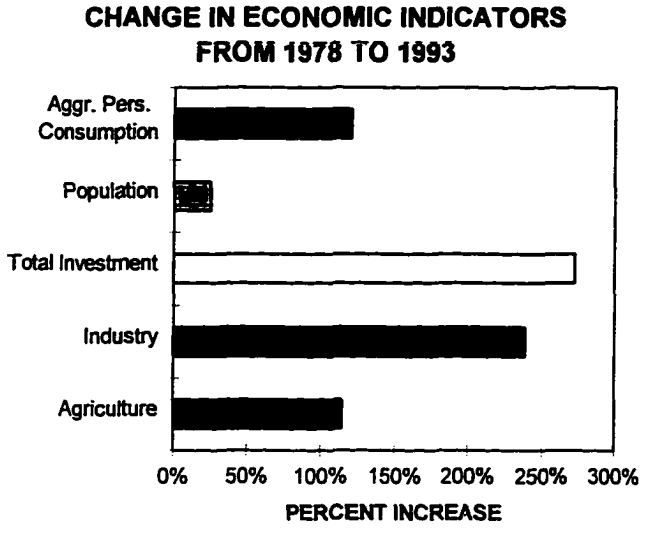
Under these conditions, agricultural stagnation and poor harvests would not only affect food supply, but also have an almost immediate and direct adverse effect on industrial expansion. This is clearly supported by the fact that the heavy-industry-oriented development strategy had temporarily to give way to the "agriculture first strategy" after the harvest failures caused by the collectivization in the late 1950s.

Demand Factors

As noted in Chapter Three, in 1975 Premier Zhou Enlai outlined a new set of economic goals designed to elevate China to the status of a front-rank economic power by the year 2000. This multistage effort, modified now as the goal to triple GNP based on 1980 by the year 2000, was reached by the end of 1995 (People Daily Overseas Edition,

Jan. 14, 1996). The gross output value of agriculture increased from ¥1,397 billion in 1978 to ¥10,996 billion in 1993 in current currency. Industrialization contributed a great deal to fulfill this economic goal. The gross output value of industry averaged a 14% annual increase rate from 1979 through 1993. In 1993, the total investment in fixed assets is more than 13 times that in 1980. During the same period the total population increased from 960 million to about 1.2 billion. The aggregate personal consumption expenditure in 1993 is more than 8 times of that in 1978 (SSB, 1994). Industrialization, the increasing in investment, population and personal consumption expenditure all resulted in a great demand for agricultural products (see Fig. 4.1).

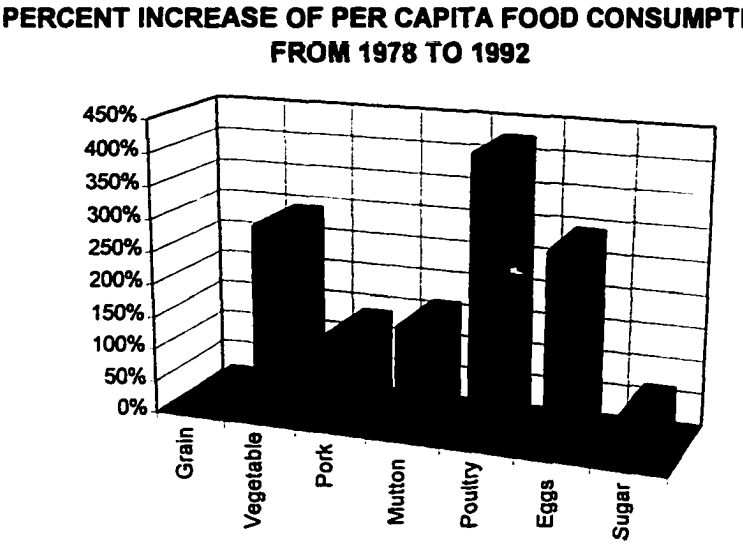
Figure 4.1




Hypothesis: High GNP growth rate, the increase in investment, the increase in population will shift demand curve out and cause prices to increase in agricultural products.

Hypothesis: The increase in personal consumption expenditure will shift demand curve out and cause prices to increase in agricultural products. In China, since incomes were quite low, direct food grain consumption rose markedly in the early years of reform. However, direct grain consumption peaked at 253 kilograms (kg) in 1986 and has since gradually declined to 236 kg in 1993. Meanwhile, consumption of meat, poultry, eggs, and so forth has continued to rise (See Figure 4.2).

Figure 4.2




Supply Factors

The cultivated area for farm crops decreased from 150 million hectares in 1978 to about 148 million hectares in 1993 (SSB, 1994). During 1978-1993 an average of 934 thousand hectares per year was lost to construction (see Table 4.1, column 2). Despite the decreasing sown areas of farm crops, the output of agricultural production kept increasing. For example, from 1978 to 1993 the output of grain increased 50%, cotton increased 72%, and oil-bearing crops increased 246% (SSB, 1994).

Hypothesis: The decrement of cultivated area for farm crops will cause prices to increase along the supply curve in agricultural products.

Hypothesis: The increment of output in agricultural products will cause prices to decrease along the supply curve in agricultural products.

**Table 4.1 Total Sown Areas of Farm Crops (1,000 hectares)**

| *Year* | Total | Year-to-Year Change of Total | Grain | Year-to-Year Change of Grain | Oil-bearing | Cotton |
|---|---|---|---|---|---|---|
| 1978 | 150104 | —— | 120587 | —— | 6222 | 4867 |
| 1980 | 146379 | -2.5% | 117234 | -2.8% | 7928 | 4920 |
| 1983 | 143993 | -1.6% | 114047 | -2.7% | 8390 | 6077 |
| 1984 | 144221 | 0.2% | 112884 | -1.0% | 8678 | 6923 |
| 1985 | 143626 | -0.4% | 108845 | -3.6% | 11800 | 5141 |
| 1986 | 144204 | 0.4% | 110933 | 1.9% | 11414 | 4306 |
| 1987 | 144957 | 0.5% | 111268 | 0.3% | 11180 | 4844 |
| 1988 | 144869 | -0.1% | 110123 | -1.0% | 10619 | 5535 |
| 1989 | 146554 | 1.2% | 112205 | 1.9% | 10504 | 5203 |
| 1990 | 148362 | 1.2% | 113466 | 1.1% | 10900 | 5588 |
| 1991 | 149586 | 0.8% | 112314 | -1.0% | 11530 | 6538 |
| 1992 | 149007 | -0.4% | 110560 | -1.6% | 11489 | 6835 |
| 1993 | 147741 | -0.8% | 110509 | 0.0% | 11142 | 4985 |

Source: SYC 1994.

Risk Premiums

Weather is one of the risks, because favorable weather can increase the output of agricultural products, while unfavorable weather can cause poor harvest. In China, the traditional independent family farm is the farming institution for the household responsibility system. The typical farm was not only small but fragmented. Most peasants were still trying to raise unit yields in agriculture through traditional methods and inputs, such as closer planting, more careful weeding, and the use of more fertilizer.

Still the output of agricultural products is determined largely by weather which is beyond the farmer's control.

**Summary**

In this chapter, I described a basic conceptual model of price formation that incorporates the effects of changes in demand and supply; in effect, a present value model of rational commodity pricing. Within the context of a review of the relevant literature I then explored which demand and supply factors might affect price formation, and how they would do so. The following chapter discusses the selection of commodities for analysis, the data, and review the behaviors of rural producers and urban consumers.

# CHAPTER FIVE

## SELECTION OF COMMODITIES FOR ANALYSIS

The previous chapter described the conceptual model and presented hypotheses about the effect of demand and supply (DS) on pricing. This Chapter will discuss the selection of commodities for analysis, the data, and review the behaviors of rural producers and urban consumers. I assume that for similar commodities (say, all grain products) the market condition would be fairly similar. Thus, in order to obtain sufficient variation in the explanatory factors to test hypotheses, I will select a number of different commodities. Given the objectives of this research, this analysis will focus on products important to the diet of lower or moderate income consumers and to the incomes of Chinese farmers who are engaged in agricultural production.

Rice is the staple food for most people in China, especially in the south. In the north and west it is too dry to grow rice, so people there also use wheat flour to make noodles and steamed bread. All grain crops are heavily subsidized and rationed. Meat is only eaten a couple of times a week, usually pork (except by the Muslims) or chicken. People eat mutton more in western China, where they graze sheep on the hills. The Chinese eat fish from both rivers and the ocean, and there are fish farms in the east. Since

China covers such a large area, there is a great diversity of fruit and vegetables, ranging from melons to apples and from Chinese cabbages to peppers.

Traditionally, the Han Chinese, the majority group, do not eat much dairy products. In the past they used all the available land for growing crops. Now imports of grain are increasing to feed the growing number of dairy animals.

Data availability greatly influenced the commodities selected for study. For urban consumer and rural farmer commodities, data on prices were used at the national average level. This is acceptable, since even though diets may vary significantly by region, the lower and moderate income households comprise more than 40% the population in the urban area. The rural population's average income is lower than that the lower income workers in the urban area. More than 70% of the total population lives in the rural area. The lower income urban workers annual living expenditures averaged U.S. $264 per capita, whereas for rural peasants, it averaged U.S. $229 (United Nations, 1995). Food accounted for 52 - 57 % of total expenditures for low and moderate income families in urban areas (see Table 5.1, columns 2-6), and 58% on average for the rural families (See Table 5.2, rows 2-3).

**Table 5.1 1993 Urban Household Annual Living Expenditures per Capita [By Percentile of Households (¥)]**

| | Average | Poor (1st 5%) | Lowest Income (1st 10%) | Low Income (2nd 10%) | Medium-low Income (2nd 20%) | Medium Income (3rd 20%) |
|---|---|---|---|---|---|---|
| Total Living Expenditures | 2110 | 1183 | 1261 | 1529 | 1770 | 2056 |
| Food | 1058 | 700 | 745 | 869 | 958 | 1065 |
| Grain | 130 | 116 | 119 | 125 | 126 | 129 |
| Meat, Poultry and Related Products | 250 | 167 | 178 | 207 | 230 | 253 |
| Eggs | 47 | 33 | 35 | 40 | 43 | 48 |
| Aquatic Products | 71 | 43 | 48 | 57 | 63 | 72 |
| Milk and Dairy Products | 20 | 9 | 10 | 14 | 17 | 20 |
| Clothing | 301 | 127 | 143 | 196 | 246 | 303 |

Source: Statistic Yearbook of China (SYC) 1994.

**Table 5.2 Per Capita Rural Household Living Expenditures (¥)**

| Year | 1978 | 1980 | 1985 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|
| Total Living Expenditures | 116 | 162 | 317 | 585 | 620 | 659 | 770 |
| Food | 79 | 100 | 183 | 344 | 357 | 379 | 447 |
| Grain | 51 | 61 | 83 | 135 | 133 | 140 | 168 |
| Non-Staple | 25 | 35 | 73 | 146 | 156 | 167 | 195 |
| Other Food | 3 | 4 | 23 | 49 | 55 | 58 | 66 |
| Clothing | 15 | 20 | 31 | 45 | 51 | 53 | 55 |

Source: SYC 1994.

**Data**

As for producers, the lowest income Chinese are peasants who live in the countryside. Their land holdings are small. Most of them use traditional production technologies, primarily to meet subsistence needs.

Fortunately, there is some information over time on the state purchasing price for crops grown by peasants. Use of the state purchasing price (which was changed to a contract negotiated price during the reform period) as a proxy for producer prices permits examination of the dynamic income changes of the Chinese peasants . However, we have to be aware that under an authoritarian regime, the government as the buyer has a great influence in the determination of the state purchasing prices. As a result, state purchasing prices are lower than free market producer prices. Although the purchase price is renegotiated seasonally, political power is a major determinants.

There are two distinct prices existing in the state commercial system, quota prices and above-quota prices. Quota prices apply to crops sold in fulfillment of procurement obligations. Crops in excess of the obligation are sold at above-quota prices. These above-quota prices tend to be market-oriented. They are important to the success of the transition from the planned economy to a free market economy. So, an investigation of price reform to these prices is an important area of study.

During the first half of fiscal year 1995, the Grain Bureaus purchased a total of 801 billion kilograms of grain. Of this, 57% was purchased at the quota prices and 43% at above-quota prices. The Grain Bureaus in most provinces regions and cities compensated peasants with subsidized chemical fertilizer (People's Daily Overseas

Edition, 01-20-96). Thus, the above quota price has its impact by increasing peasants' real income. Therefore, market price have its role in guidance of agricultural production.

After all, we are going to use a time series error correlation model for econometric regression. Instead to simply look for market equilibrium prices, this estimating model attempts to include factors expected to underlie changes, and to incorporate the existence of a quota price and an above quota price. Price data for consumer goods and state purchasing prices since 1978 are available. Prices were collected by the State Statistic Bureau (SSB) in various local markets in 30 cities and provinces. The time period under consideration begins in January 1978 and ends in December 1993 for both consumer and producer commodities.

In addition, economists frequently assume that production of tradable goods will increase due to economic reforms. Trade liberalization will allow peasants to benefit from trade. An investigation of price reform of these fairly commercialized products will test the basis of the assumption by answering the question of whether or not under the new policies agricultural prices actually do reflect peasants' opportunity costs.

**Consumer Commodities**

In choosing consumer commodities, I want to include those goods that formed an important part of a lower and moderate income family's basic diet. Quantity of consumption (that is, how much a family eats a certain food) seems to be the best criterion to use to select products. Quantity of consumption is a good indicator of a family's consumption habits, although it may have little to do with food expenditures or

nutrition. Nevertheless, if a family consumes a good in high volume, then the good is in some sense "important" to them.

The impacts of a good on the family's expenditure are also a plausible mean of evaluating "how important" a good is to the family, as is the quantity of a good consumed and then, to the extent possible, this list can be compared against the importance of the good to the family from the standpoint of expenditure and quantity. Table 5.3 detailed the quantities of per capita consumption for selected consumer goods. Table 5.4 and Table 5.5 described the annual quantities per capita purchases of major commodities for urban and rural households respectively.

**Table 5.3 Per Capita Consumption of Selected Consumer Goods (kg)**

| *Year* | Grain | Edible Vegetable Oil | Pork | Beef & Mutton | Poultry | Eggs | Sugar |
|---|---|---|---|---|---|---|---|
| 1957 | 203 | 1.1 | 2.4 | 1.1 | 0.5 | 1.3 | 1.5 |
| 1962 | 165 | 1.1 | 2.2 | 0.8 | 0.4 | 0.8 | 1.6 |
| 1965 | 183 | 1.7 | 6.3 | 1.0 | 0.4 | 1.4 | 1.7 |
| 1970 | 187 | 1.6 | 6.0 | 0.8 | 0.3 | 1.3 | 2.1 |
| 1975 | 191 | 1.7 | 7.6 | 0.7 | 0.4 | 1.6 | 2.3 |
| 1978 | 196 | 1.6 | 7.7 | 0.8 | 0.4 | 2.0 | 3.2 |
| 1980 | 214 | 2.3 | 11.2 | 0.8 | 0.8 | 2.3 | 3.8 |
| 1983 | 232 | 4.0 | 12.3 | 1.1 | 1.2 | 3.0 | 4.5 |
| 1984 | 250 | 4.7 | 12.9 | 1.2 | 1.2 | 3.9 | 4.9 |
| 1985 | 252 | 5.1 | 13.8 | 1.3 | 1.6 | 4.9 | 5.6 |
| 1986 | 253 | 5.2 | 14.0 | 1.3 | 1.7 | 5.2 | 6.0 |
| 1987 | 249 | 5.6 | 14.4 | 1.4 | 1.7 | 5.5 | 6.6 |
| 1988 | 246 | 5.9 | 14.7 | 1.6 | 1.8 | 5.7 | 6.2 |
| 1989 | 239 | 5.4 | 15.4 | 1.6 | 1.8 | 5.9 | 4.9 |
| 1990 | 239 | 5.7 | 16.6 | 1.7 | 1.7 | 6.3 | 5.0 |
| 1991 | 235 | 5.9 | 17.4 | 1.8 | 2.0 | 7.1 | 5.0 |
| 1992 | 236 | 6.3 | 18.2 | 2.1 | 2.3 | 7.8 | 5.4 |

Source: SYC 1994.

**Table 5.4 Urban Household Annual per Capita Purchases of Major Commodities (kg)**

| *Year* | 1985 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|
| Grain | 135 | 134 | 131 | 128 | 112 | 98 |
| Fresh Vegetables | 144 | 145 | 139 | 132 | 125 | 121 |
| Edible Vegetable Oil | 5.8 | 6.2 | 6.4 | 6.9 | 6.7 | 7.1 |
| Pork | 16.7 | 17.5 | 18.5 | 18.9 | 17.7 | 17.4 |
| Beef and Mutton | 2.0 | 2.7 | 3.3 | 3.3 | 3.7 | 3.4 |
| Poultry | 3.2 | 3.7 | 3.4 | 4.4 | 5.1 | 3.7 |
| Fresh Eggs | 6.8 | 7.1 | 7.3 | 8.3 | 9.5 | 8.9 |
| Aquatic Products | 7.1 | 7.6 | 7.7 | 8.0 | 8.2 | 8.0 |
| Sugar | 2.5 | 2.4 | 1.1 | 1.8 | 1.9 | 1.8 |

Source: SYC 1994.

**Table 5.5 Rural Household Per Capita Consumption on Major Consumer Goods (kg)**

| *Year* | 1978 | 1980 | 1985 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|
| Unprocessed Grains | 248 | 257 | 257 | 262 | 256 | 251 | 266 |
| Wheat and Rice | 123 | 163 | 209 | 215 | 214 | 211 | 221 |
| Fresh Vegetables | 142 | 127 | 131 | 134 | 127 | 129 | 107 |
| Edible Vegetable Oil | 2.0 | 2.5 | 4.0 | 5.2 | 5.7 | 5.9 | 5.7 |
| Pork, Beef and Mutton | 5.8 | 7.8 | 11.0 | 11.3 | 12.2 | 11.8 | 11.7 |
| Poultry | 0.3 | 0.7 | 1.0 | 1.3 | 1.3 | 1.5 | 1.6 |
| Eggs and Related Products | 0.8 | 1.2 | 2.1 | 2.4 | 2.7 | 2.9 | 2.9 |
| Fish and Shrimp | 0.8 | 1.1 | 1.6 | 2.1 | 2.2 | 2.3 | 2.5 |
| Sugar | 0.7 | 1.1 | 1.5 | 1.5 | 1.4 | 1.5 | 1.4 |

Source: SYC 1994.

Theoretically, if a household spends a lot on certain items, then increases in those prices could have a substantial impact on consumption patterns. Halbrendt, Tuan, Gempesaw, and Dolk-Etz (1994) analyzed Chinese consumer behavior based on rural Guangdong Province household survey data. They found that for most food items, estimated own-price elasticities were inelastic. Commodity substitution due to relative price changes was small, except in the case of grain. Commodities most responsive to expenditures were meats, poultry, fruits, sweets, and durable goods.

Consumption surveys conducted by the State Statistic Bureau (SSB) in China for the time period of the study (1978 to 1993) were available to assist in the selection of commodities to be used in this study. The sample size is 24,338 households in 1985 and 35,390 in 1993 located in different geographical areas and cities in urban areas; 15,914 in 1980 and 67,570 households for rural areas (see Table 5.6 and 5.7, row 2).

**Table 5.6 Results of a Sample Survey for Urban Households**

| *Year* | 1985 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| Number of Households Surveyed | 24,338 | 35,660 | 36,730 | 36,290 | 35,390 |
| Average Persons per Household | 4 | 4 | 3 | 3 | 3 |
| Annual Income Per Capita (¥) | 749 | 1523 | 1713 | 2032 | 2583 |
| Annual Living Expenditures Per Capita (¥) | 673 | 1279 | 1454 | 1672 | 2111 |
| Food (¥) | 352 | 694 | 783 | 885 | 1058 |
| Clothing (¥) | 98 | 171 | 200 | 241 | 301 |

Source: SYC 1994.

**Table 5.7 Results of Sample Survey for Rural Households**

| Year | 1980 | 1985 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|
| Number of households Surveyed | 15914 | 66642 | 66960 | 67410 | 67490 | 67570 |
| Average Permanent Resident per Household | 6 | 5 | 5 | 5 | 5 | 5 |
| Average Per Capita Annual Income (¥) | 216 | 547 | 990 | 1046 | 1155 | 1334 |
| Average Per Capita Annual Expenditures (¥) | 196 | 486 | 903 | 980 | 1056 | 1211 |
| Living Expenditures (¥) | 162 | 317 | 585 | 620 | 659 | 770 |
| Taxes and Payments to Collectives (¥) | 0.24 | 16 | 33 | 36 | 41 | 42 |

Source: SYC 1994.

I chose six consumer commodities for analysis based on the SSB's category of commodities. The data for food, (grain, non-staple foods, and fresh vegetables), other foods, and cotton cloth run from 1978 to 1993. These six commodities were on all of the SSB surveys. Although the households studied are not strictly comparable, consumption patterns seem to have varied a little over time. Given this consistency, I chose these nine commodities for analysis. They seem very likely to be commodities that form part of a typical consumption basket of lower and moderate income urban household.

Note the lack of diary products and citrus fruit in the diets of the lower and moderate income families. For most urban lower and moderate income families, fruit is scarce, and so is fresh milk. Data for edible vegetable oil, meat, poultry and eggs, and aquatic products run only from 1984 to 1993, which prevented their use in regression.

The aim in commodity selection was not to provide a complete or exhaustive list of goods. Rather, I simply wanted to include a reasonable representation of those goods

consumed by a typical lower and moderate income household. This is the criteria used for the evaluation of the original list of nine products, and the list can be said to meet that criterion.

Certainly, some foods might arguably be excluded; some others might be included. As a group, however, the relatively few foods on this list are among the most commonly consumed, and they make large contributions to expenditures. They also cover a wide range of commodity categories and types. This variation will be important for investigating factors that affect dynamic income on lower and moderate income households.

In looking at other possible goods for study, no product is consistently confirmed across studies as being "important" to the diet, whatever the criteria used. Even though the statistics show the consumption of cigarettes and liquors were increasing with the increase in the income, I eliminated them from my study, because these commodities are not necessary for keeping people alive.

The allocation of the budget to specific foods probably did not change dramatically from 1978 to 1993, although there were some price and income effects. The data from the 1993 survey indicate that the commodities selected on the basis of the previous surveys were still important to the typical diet of the urban lower and moderate income families in the early half of the 1990s, thereby supporting this selection.

**Producer Commodities**

The process of selecting agricultural commodities was more intuitive. I intended to select products that were important to the peasants. Although area, production, and value could be used as criteria (see Table 5.8), I also wanted to include a selection of commodities that were of potential or growing importance to the national economy. Thus, I reviewed recent production statistics to get a better idea of the future direction of different commodities (Statistics Yearbook of China, 1994; Almanac of China's Economy, 1994; Statistical Yearbook for Asia and the Pacific, 1991; Monthly Bulletin of Statistics, 1972-95; International Financial Statistics Yearbook, 1994; and International Historical Statistics Africa and Asia, 1982). I also reviewed studies about China's agriculture (World Bank 1993, *Global Economic Prospects and the Developing Countries*, *International Trade and Commodity Markets*, *The Agricultural Transition in Central and Eastern Europe and the Former USSR;* Fan and Wailes, 1994, Food Demand in Rural China: Evidence from Rural Household Survey; Lewis, P. and Andrews, 1989, Household Demand in China; and Fan, Wailes and Cramer, 1995, Household Demand in Rural China: A Two-Stage LES-AIDS Model ).

I chose fourteen commodities from SSB's categories that represent a wide range of production. They are grain, wheat, rice, corn, sorghum, soybeans, edible vegetable oil and oil bearing crops, cotton, livestock for slaughtering, poultry and eggs, fresh vegetables, chicken eggs, fattened hogs, and aquatic products. Data on these commodities runs from 1978 to 1993. Some are traditionally important, either to the agroindustries of the area (e.g., cotton) or to the peasants (e.g., rice, corn, and wheat).

Most of them have two prices: quota price and above-quota price, except livestock for slaughtering, poultry and eggs, fresh vegetables, and aquatic products. The selected products represented 85 - 89% of total sown areas of farm crops (See Table 5.8), plus production of livestock for slaughtering, poultry and eggs, fresh vegetables, and aquatic products, so they are a reasonable sample of agriculture in China.

**Summary**

This chapter described how we selected the commodities for analysis. We chose consumer commodities on the basis of importance of goods to the diet of lower and moderate income urban households. Determination of which goods were important was based on the SSB's surveys conducted during the period of this study.

Because the only information on agricultural prices that was useful came from the SSB, I selected producer commodities based on the importance, or potential importance, of the good to the nation's agriculture. Determination of the producer commodities for study depended on data from the SSB, and from study and individual knowledge about China's agriculture. Next Chapter translates the present value model into an estimable econometric model that will test the hypothesis presented in Chapter Four.

# CHAPTER SIX

## DEVELOPMENT OF THE ECONOMETRIC MODEL

The previous chapter described the data for this quantitative study. The model building procedure introduced in this chapter consists of development of the econometric model, an iterative cycle of identification, estimation, and diagnostic checking.

The first section briefly describes how the theoretical econometric model was developed. The next section consists identifying the distribution of the data for the models. I examine the long-run properties of the individual variables by using two different measures: time plots and unit root tests. This decision was important because it determines which process might adequately describe a given time series. The Granger-Engle two-step procedure then was used in the econometric regression to obtain results for the time series error correlation models, and I discuss some of the econometric challenges presented by the estimation. A final section obtains the result described in the next chapter.

**Development of the Theoretical Econometric Model**[1]

Assume that we can use futures prices to measure the net marginal convenience yield for agricultural commodities with actively traded procurement contracts. Let $\psi_{t,T}$ be the (capitalized) flow of marginal convenience yield net of production costs over the period t to t + T, per unit of agricultural goods. Then, to avoid arbitrage opportunities, $\psi_{t,T}$ must satisfy (Pindyck, 1993):

$$\psi_{t,T} = (1 + r_T)P_t - f_{T,t}, \tag{6.1}$$

where $P_t$ is the spot price, $f_{T,t}$, is the procurement contracts price for government's purchasing at t + T, and $r_T$ is the risk free T-period interest rate. To see why (6.1) must hold, note that the (stochastic) return from holding a unit of the good from t to t + T is $\psi_{t,T}$ + $(P_{t+T} - P_t)$. If one also shorts a procurement contract at time t, one receives a total return of $\psi_{t,T} + f_{T,t} - P_t$. No outlay is required for the procurement contract and assuming this total return is non-stochastic, so it must equal $r_T P_t$, from which (6.1) follows.

Note that for the present value model to hold, the agricultural goods must always be in production, i.e., the procurement contract must be fulfilled. We never observe aggregate output of agricultural goods falling to zero in the data. One could argue that some agricultural goods might go out of production with very low probability (but at very high cost to the government), so they are simply not observed in a sample of 15 years. Besides, the aggregate output of agricultural goods for different commodities and

[1]. Note that our deviation are closely following Pindyck's (1993).

regions that go out of production might occur for some goods and/or regions. But these are not likely problems for the commodities studied here.

As will become apparent, all the data is annual data, and taken from SSB's Statistical Yearbook of China(SYC, 1994). I utilize the sample period from 1978 to 1993. This data, as well as data on GNP, savings, investment, consumer price index; and the aggregate personal consumption expenditure, are in constant, 1978 currency.

Campbell and Shiller (1987) have shown, if $P_t$ and $\psi_t$ are both integrated of order 1, the present value relation of (4.5) implies that they are cointegrated, and the cointegrating vector is $(1 - 1/\mu)'$. We can therefore define a "spread",

$$S_t = P_t - (1/\mu)\psi_t , \tag{6.2}$$

which will be stationary. Hence, in principle, we could estimate the expected return on a good, $\mu$, by running a cointegrating regression of $P_t$ and $\psi_t$.

In addition, it is easily shown that (4.5) and (6.2) imply that:

$$S_t' = (1/\mu)E_t\Delta P_{t+1} \tag{6.3}$$

Hence $P_t$ and $\psi_t$ contain all of the information necessary to forecast $P_{t+1}$ optimally. Substituting (6.1) and (6.2) into (6.3) gives the standard result:

$$E_t P_{t+1} = F_{1,t} + (\mu - r) P_t , \tag{6.4}$$

i.e. the procurement contract price is a biased predictor of the future spot price, and the bias is equal to the good's expected excess return. Thus either (6.3) or (6.4) can be used to forecast $P_{t+1}$ if $\mu$ is known. Finally, Campbell and Shiller also show that (4.5) and (6.2) together imply that:

$$\mu S_t' = E_t \sum_{i=0}^{\infty} \delta^i \Delta\psi_{t+i} \qquad (6.5)$$

so that $\mu S_t'$ is the present value of expected future changes in the convenience yield (Pindyck, 1993).

We can use (6.3) and (6.5) to see how procurement contracts and spot prices describe the market's expectation of how $\psi_t$ and $P_t$ will evolve. Assume for simplicity that $\mu = r$, so that $S_t' = (1/r)(F_{1,t} - P_t)$. This is approximately the case for most agricultural goods.

First, suppose that $\psi_t' = 0$, so that $E_t(P_{t+1}) = F_{1,t} = (1 + r) P_t$, and $S_t' = P_t$. Although convenience yield is currently zero in this case, farmers produce the good and rationally expect price to rise at the rate of interest, because they expect the convenience yield to rise in the future.

Now suppose that $P_t < F_{1,t}$. Then $S_t' > 0$, and both price and convenience yield are expected to rise. These patterns for $P_t$ and $F_{1,t}$ can be seen in the data for food and agricultural products during the time period this study covered (see Table 7.5 Observation of Producer Goods Pricing).

As Campbell and Shiller (1987) have shown, (6.3) and (6.5) can be used to test the present value model. Let $\mu = r$, and consider a vector of variables $Z_i$ (e.g. production, inventories, etc.) that might be expected to affect procurement contract prices. Then (6.3) implies that in regressions of the form:

$$\Delta P_t = \alpha_0 + \alpha_1 P_{t-1} + \sum_i \beta_i Z_{i,t-1} + \varepsilon_t \qquad (6.6)$$

where $Z_i$ is any variable that might affect price. This includes good-specific variables (such as production (output level) and inventories), and economy-wide variables, such as GNP growth, saving, investment[2], population growth, consumer price index; foreign exchange rate, the aggregate personal consumption expenditure, national income, money supply, and the index of investment.

From econometric point of view, $\Delta P_t$ is an observation of a good's market price variation in the *t*th time period (recall that here *t* represents the time period of the observation, not a lag); $Z_{i,t-1}$ is the corresponding *i*th observation for the $Z_i$ variable; $\alpha_0$ is the intercept; $\alpha_1$ and $\beta_i$ are the slope coefficient for the variable $P_{t-1}$ and $Z_{i,t-1}$

---

[2]. Before 1990 I used total savings of national income (Almanac of China's Economy, 1994) as a proxy of the investment. Since 1990 the real investment value (SYC, 1994) was used. The investment was less than total savings of national income before 1992 and bigger than the total saving of national income after 1992, because of more foreign direct investment, foreign funding and other funding.

respectively; and $\varepsilon_t$ is normally and independently distributed random disturbance term with mean of zero and variance $\sigma^2_\varepsilon$.

One problem is that if $P_t$ and $\psi_t$ are in nominal terms, the nominal expected return will fluctuate, even if the real return is constant. I deal with this for the agricultural good pricing by deflating the variables (Cambell and Shiller, 1987).

**The Econometric Model in the Chinese Context**

Equation 6.6 provides the most general econometric model. The quantitative analysis focuses on pricing in food and agricultural markets. The study examines the price formation of consumer prices in the urban markets and producer prices in the rural markets.

Equations 6.7 and 6.8 apply the basic model developed above to these markets. In order to distinguish among these models, I refer to them by the marketing agent who actually confronts the price change. Thus, in the first equation, the "equation agent" is the producer; in the second, the consumer.

Producer Pricing

$$\Delta P_{t,\,\text{producer}} = \alpha_{0,\,p} + \alpha_{1,p} P_{t-1,\,\text{producer}} + \sum_{i,p} \beta_{i,p} Z_{i,p\,t-1} + \varepsilon_{t,p} \qquad (6.7)$$

Consumer Pricing

$$\Delta P_{t,\,\text{consumer}} = \alpha_{0,c} + \alpha_{1,c} P_{t-1,\,\text{consumer}} + \sum_{i,c} \beta_{i,c} Z_{i,c\,t-1} + \varepsilon_{t,c} \qquad (6.8)$$

where the P in each equation stands for "price". These equations lead to one point. The price formation depends on demand and supply in the economy. The price formation coefficient is a quantitative representation of the impact of each of them, and so it is a representation of demand and supply (DS) forces.

For purposes of estimation, although these prices can be much more complex, I have assumed very simple prices for the goods selected for study. The producer equation relates producer prices to the demand and supply. Again, it is likely that the actual prices are much more complex. They involve a great number of different prices for the same good, because of the quota price and above-quota price, which are replaced by procurement contract prices. The contract price was a weighted average of the basic quota price and above-quota price, and free market price (SYC, 1994).

China had more than 33,000 **free** markets on the eve of reform in 1978. Once the freedom to market was expanded and the state curtailed its traditional dominance of food distribution through the procurement system, **free** markets expanded dramatically. Between 1978 and 1993, the number of these markets more than doubled to 83,000, and more importantly, the transactions volume soared from ¥12.59 billion (in 1978) to ¥5,343 billion (in 1993). The share of agricultural output sold through the market rose from less than 10% in 1978 to 49% in 1993 (Chinese Statistical Abstract 1993; Almanac of China's Economy 1994; Statistical Yearbook of China 1994).

For the consumer equation, consumer prices are a function of changes in demand and supply. In a few cases these prices may not actually have any physical link with the

demand and supply, because of the government subsidy and rationing. However, for most of the goods, consumers buy directly from the producer. Nevertheless, the equation's specification is appropriate for the following reasons.

First, the price subsidy of a good is a relative concept, and can vary depending on producer prices and transportation costs. Just because a good does not appear to have a link with the demand and supply through subsidy does not mean that the impact of demand and supply is irrelevant. In fact, we would suspect that the government and producer still view the change in demand and supply as a key signal to determine the subsidy and price respectively.

Second, one of the promises of economic reform is that the consumers and producers will see the free market price, which in turn is a function of the change in demand and supply. This specification provides a direct test of that assumption.

Third, a better specification might have included the rationing of prices to explicitly capture the fact that the government subsidy is an alternative to the fluctuation in demand and supply. We should recall that this idea is at least partially incorporated into the model specification. The DS factors that explain pricing in the consumer equation do also include variables that capture the power of demand and supply in the market. Since 1955, a coupon rationing system for grain and edible vegetable oil was in continuous use. Beginning in 1992 in most urban areas, including by May 1993 in Beijing, this system was abolished. The consumer prices of grain and oils were fully decontrolled (Lardy, 1994).

**Econometric Issues in Estimation**

The estimation of these models presents some econometric challenges. I discuss these briefly below. Like the conventional approach, I take the natural log of data with the hope that it will shape the distribution of the data to some extent without losing a lot of information.

**The Econometric Challenges**

Limitation of the Data. A major limitation of this study is the fact that the data with which the author worked are not the best. Josiah Stamp (1929, pp. 258-9) has a well-known expression for this feeling:

"The governments are very keen on amassing statistics - they collect them, add them to the n*th* power, take the cube root and prepare wonderful diagrams. But what you must never forget is that every one of those figures comes in the first instance from the village watchman, who just puts down what he damn pleases."

There is concern about the errors-in-variables problem with the implication of using incorrectly measured variables. These errors might arise from the government measurement, or propaganda bias, or from the use of proxy variables in place of unobservable variables suggested by economic theory.

Errors in measuring the dependent variables are incorporated in the disturbance term; their existence causes no problems. When there are errors in measuring an independent variable, however, the fourth assumption of the Classical Linear Regression (CLR) Model is violated, since these measurement errors make this independent variable

stochastic. The seriousness of this depends on whether or not this regressor is distributed independently of the disturbance. The incorrectly measured regressor might create a new disturbance term, involving the measurement error embodied in the new regressor. Thus, the OLS estimator is biased even asymptotically. When there exists contemporaneous correlation between the disturbance and a regressor, the most common solution used in this context is the instrumental variable (IV) estimator, or two-stage least squares (2SLS) estimation.

How do we know when there is contemporaneous correlation between the errors and the regressor? A testing methodology popularized by Hausman (1978) is used for this purpose. Hausman tests operate by comparing two estimates of $\beta$, one computed making use of all the assumptions, another using more limited information. If the model is correctly specified, $\beta_1\hat{} - \beta_2\hat{}$ should be close to zero, where $\beta_1\hat{}$ is the less efficient estimator. This result is valid **only** when $\beta_2\hat{}$ is efficient and $\beta_1\hat{}$ is based upon the same or a smaller information set.

In this study, I was unable to get any efficient $\beta_2\hat{}$, because of the shortage of "all the exogenous variables". A typical example is the estimation of China's GNP. Since China's economic reforms have contributed to a substantial acceleration of its economic growth, measuring the level of output in term of dollars is far more uncertain and thus controversial. In 1993, this issue gained substantially increased attention because of a widely publicized report of the IMF (*World Economic Outlook*, 1993). Reported results of this study and IMF-provided unpublished information concluded that China's economy was about four times larger than the previous most widely quoted figure.

These and other dollar estimates of China's GNP are reported in Table 6.1 (Lardy, 1994).

**Table 6.1 Dollar Estimates of China's GNP**

| Source of Estimate | Year | Dollars per Capita | Total GNP (Trillions of Dollars) | Share of World GNP |
|---|---|---|---|---|
| World Development Report 1982[1] | 1980 | 290 | 0.25 | N.A. |
| Summers and Heston (1991, 352)[2] | 1988 | 2,308 | 2.56 | 15.0 |
| World Development Report 1992[1] | 1990 | 370 | 0.36 | 1.6 |
| Lardy (1993, 5)[2] | 1990 | 1,000-1,200 | 1.14-1.37 | 5.1-6.1 |
| Asian Wall Street Journal (May 31, 1993, 21)[2,3] | 1990 | 1,300 | 1.47 | 6.6 |
| World Bank (1992a, 276)[2] | 1990 | 1,950 | 2.20 | 9.9 |
| Asian Wall Street Journal (May 31, 1993, 21)[2,5] | 1990 | 2,598 | 2.90 | 13.0 |
| World Development Report 1993[1] | 1991 | 370 | 0.37 | 1.6 |
| World Bank (1993a, 236)[2] | 1991 | 2,040 | 2.35 | 10.9 |
| New York Times (May 20, 1993, A1[2,4] | 1992 | ,600 | 1.66 | 6.0 |

1. Based on the official exchange rate.
2. Based on the purchasing power of the Chinese currency.
3. An IMF extrapolation of an by Taylor (1991). Taylor's estimate is that China's CNP in 1981 was $417.8 billion. That is equivalent to $410 per capita and is 58% greater than the World Development Report 1993 (152) estimate of $264.34 billion for the same year.
4. An extrapolation of the estimates of Asian Wall Street Journal, in 1990 prices.

5. An extrapolation/update of the previous estimates of Asian Wall Street Journal, in 1990 prices.

One of the explanations about the different GNP value in the same year is that of the degree of overvaluation in Chinese currency. However, several economist's estimations based on purchasing power of the *renmibi* (Chinese currency) are different substantially, from $1,000 to $2,598 per capita.

The basic problem is that the data available are inadequate. Summers and Heston's estimates are based primarily on the work of Professor Irving Kravis (1981). Who acknowledged that his analysis of China was rough and subject to even larger margins of error formally included in the International Comparison Project (ICP), which he directed for many years. One of the reasons is that the set of commodity price data he was able to collect for China was too small, fewer than 100 commodities compared with the 300 - 500 prices for the ICP country studies.

The IMF estimate published in 1993 is based on an earlier study of Jeffrey Taylor (1991). His analysis is based on relative price ratios for more than 200 commodities, but he suggested, it would be benefit from more refined yuan-dollar price ratios.

Causality and Feedback. Research workers often find it necessary to discuss the causation of an event or sequence of events, and when analyzing time series data it is useful to ask if one group of series is generated separately from another group. Feedback will occur if Y causes X and also X causes Y. I assumed that movements in the dependent variables are caused by movements in the independent variables, but the existence of a relationship between these variables proves neither the existence of

causality nor its direction. Using the dictionary meaning of causality, it is impossible to test for causality (Kennedy, 1992). Although various possibilities are discussed in Granger (1985a). However, it is clear that it is not possible, in general, to differentiate between instantaneous causation in either direction and instantaneous feedback.

For the commodity price indexes and GNP, the total output of agriculture is less than 25% of GNP in 1993, therefore, a single agricultural good's price index does not weight very much in GNP. As far as our concern about the commodity price index and CPI, SSB choose 382 kinds commodities' urban retail price indexes and service price indexes to calculated their weighted arithmetic mean as the CPI. Thus, a single food or agricultural good's price index does not weight very much, too.

For the producer and consumer equations, it is almost certainly correct to specify producer and consumer prices as functions of demand and supply. Even though consumer prices do possibly influence producer prices and verse versa, most economists consider a commodity price to be a function of economic fundamentals, not the interaction between the consumer price and the producer price.

The causality tests do not actually prove direction of causality. They only indicate if there is additional information to be gained by supposing that a relationship is bi-directional(Garrett, 1995). As noted above, there is no good reason to think that such a relationship exists among these prices. Thus, I assume that the direction of causality is as indicated. For both theoretical and practical reason, I did not perform specific tests for causality.

**Estimation of the Pricing Model**

Time Series Model Building. The time series model building procedure just described constitutes an attempt to construct, from a given set of data, the underlying stochastic process that might have generated the given observations. Such a task is, of course, extremely formidable and, indeed, would remain so even if the samples generally available were very large (Granger, and Newbold, 1986).

As noted, the model building procedure introduced in this section consists of an iterative cycle of identification, estimation, and diagnostic checking. Not surprisingly, the stage that causes the most difficulties in practical attempts at time series model building is identification. Here I am required to choose from a wide class of models a single process that might adequately describe a given time series. While some objective criteria are available on which a rational choice can be based, it remains the case that there does not exist a clearly defined procedure leading in any given situation to a unique identification. Rather, it is necessary to exercise a good deal of judgment at this stage, for example, the univariate properties. To some extent, experience with the procedures involved will increase the chances of successful identification. The model chosen is subjected to check on its validity, and the iterative nature of the model building process allows me the possibility of making appropriate selection.

Univariate Properties. I examine the long-run properties of the individual variables by using two different measures: time plots and unit root tests. Time plots of the individual variables in levels and differences (Figures 6.1 - 6.27) show that all of the variables except

price index of other food are likely to be nonstationary. The above observations are largely confirmed in the Dickey-Fuller (Dickey, 1976; Dickey, and Fuller, 1979) test. From Table 7.1 (in Chapter Seven), it is clear that the null hypothesis cannot be rejected at conventional levels of 5% significance for all of the variables, except price index of other food.

Therefore, It is very important to remove certain kinds of non-stationarity by suitable differencing in this econometric study of time series data. Like most of empirical work in macroeconomics, in this study, differencing of given series is required to produce stationarity. The models based on the differenced series generally provide superior representation to the low-order autoregresive processes. Granger's (1966) typical spectral shape of economic time series provided further evidence for this contention. Thus, we imposed a further restriction by assuming that the time series under consideration can be well represented, after appropriate differencing.

Cointegration. A nonstationary variable will tend to wander extensively (that is what makes it nonstationary), but some pairs of nonstationary variables can be expected to wander in such a way that they do not drift too far apart, thanks to disequilibrium forces that will tend to keep them together. In this study, some examples of pairs of co-varying, nonstationary variables are short-term and long-term interest rates, prices and wages, household income and expenditures, spot and procurement contract price of an agricultural good, and exchange rates determined in different markets. Such variables are said to be cointegrated: although individually they are integrated of order $d$, $I(d)$, a particular linear combination of them is integrated of order zero, $I(0)$. The cointegrating

combination is interpreted as an equilibrium relationship, since it can be shown that variables in the error-correlation term in an Error Correlation Model (ECM) must be cointegrated, and vice versa, that cointegrated variablcs

**Figure 6.1 Aggregate Personal Consumption, and First Difference**

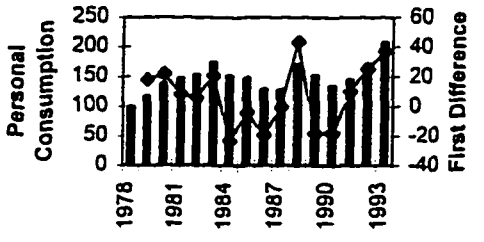



**Figure 6.2 Gross National Product, and First Difference**

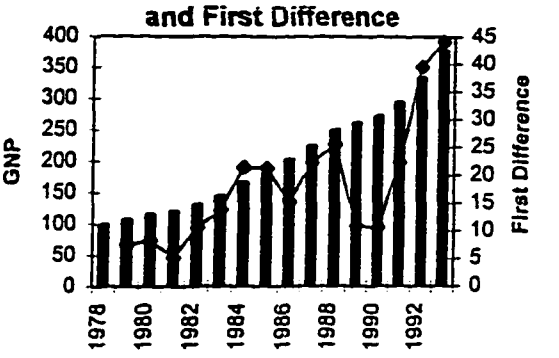



**Figure 6.3 Money Supply, and First Difference**

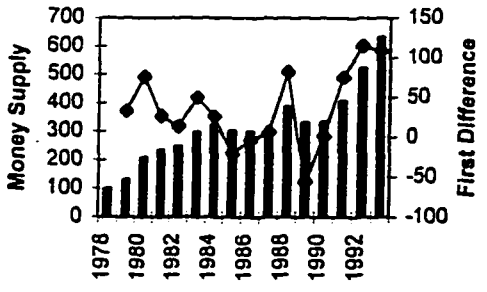



**Figure 6.4 Savings, and First Difference**

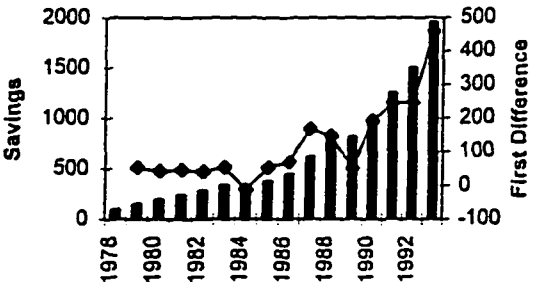



**Figure 6.5 Investment, and First Difference**

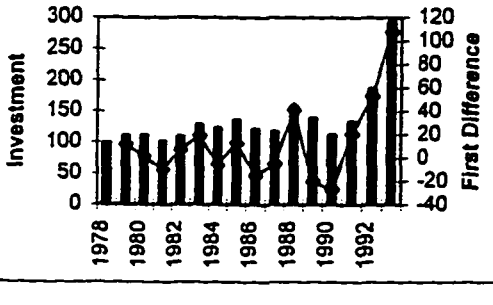



**Figure 6.6 Consumer Price Index, and First Difference**

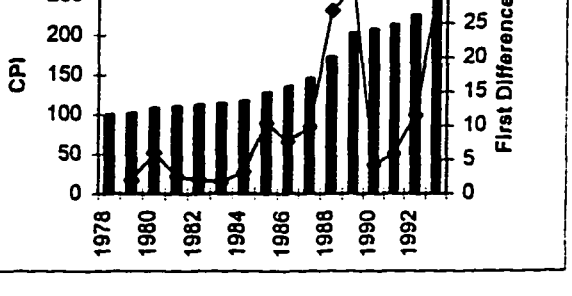


**Figure 6.7 Consumer Price of All Food , and First Difference**

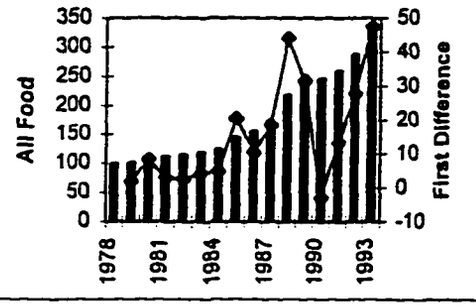



**Figure 6.8 Consumer Price of Clothing, and First Difference**

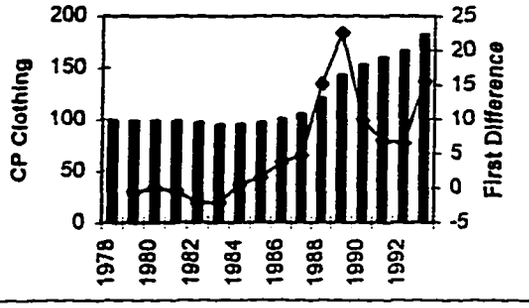



**Figure 6.9 Consumer Price of Grain, and First Difference**

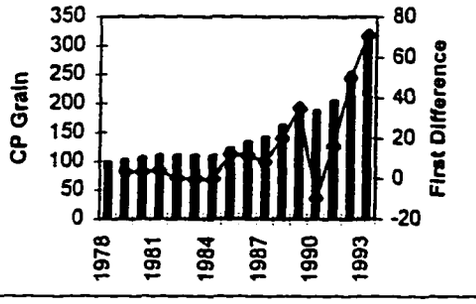



**Figure 6.10 Consumer Price of Non-Staple Food, and First Difference**

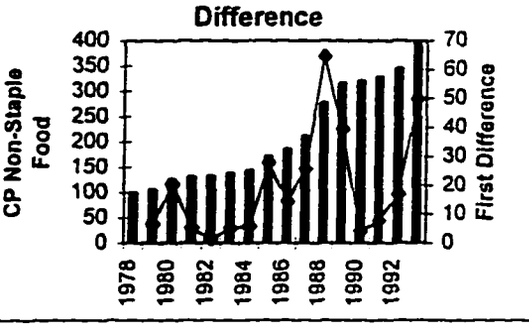



**Figure 6.11 Consumer Price of Fresh Vegetables, and First Difference**

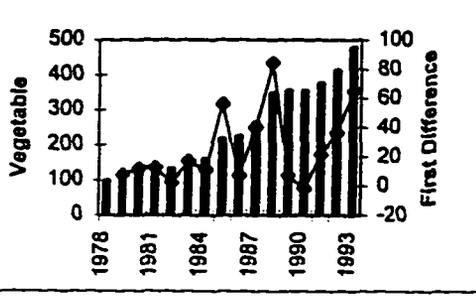



**Figure 6.12 Consumer Price of Other Foods, and First Difference**

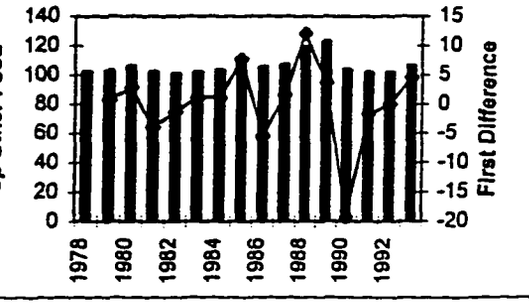


**Figure 6.13 Consumer Price Index of Agricultural Producer Goods, and First Difference**

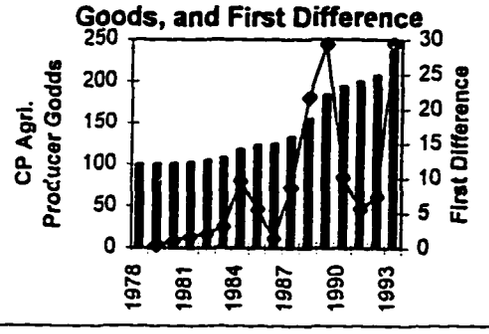



**Figure 6.14 Producer Price of Grain, and First Difference**

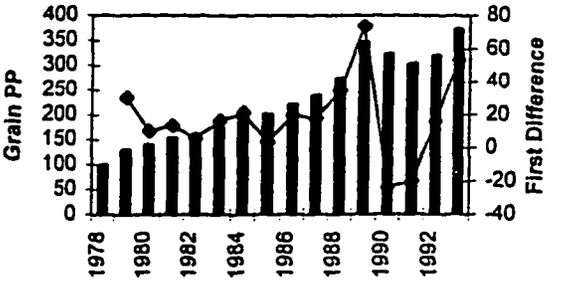



**Figure 6.15 Producer Price of Wheat, and First Difference**

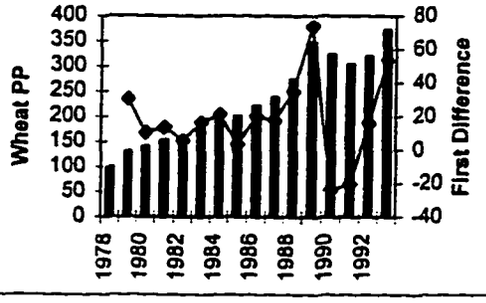



**Figure 6.16 Produce Price of Rice), and First Difference**

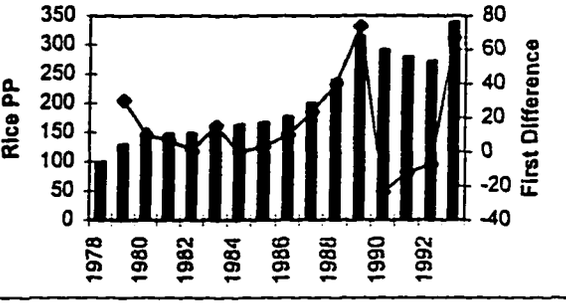



**Figure 6.17 Producer Price of Corn, and First Difference**

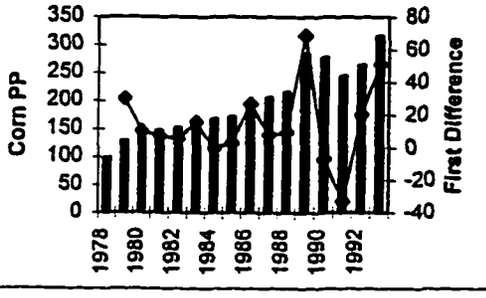



**Figure 6.18 Producer Price of Sorghum, and First Difference**

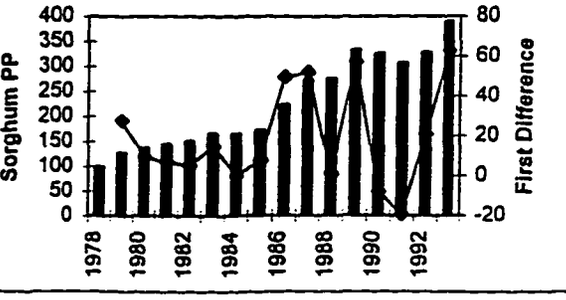


**Figure 6.19 Producer Price of Soybeans, and First Difference**

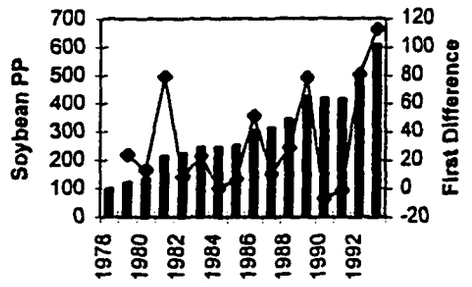



**Figure 6.20 Producer Price of Edible Vegetable Oil & Oil Bearing Crops, and First Difference**

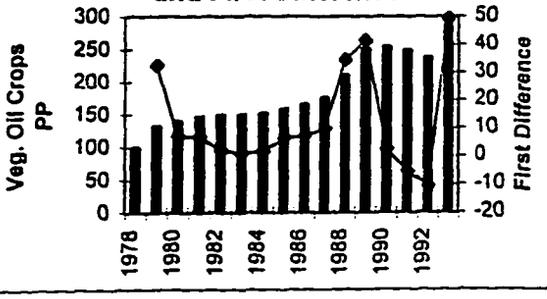



**Figure 6.21 Producer Price of Cotton, and First Difference**

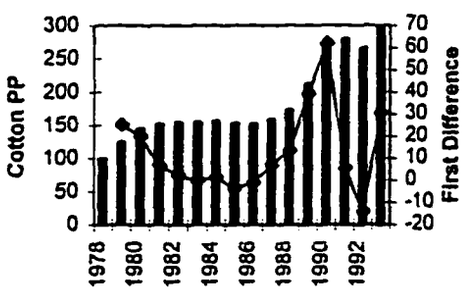



**Figure 6.22 Producer Price of Livestock for Slaughtering, and First Difference**

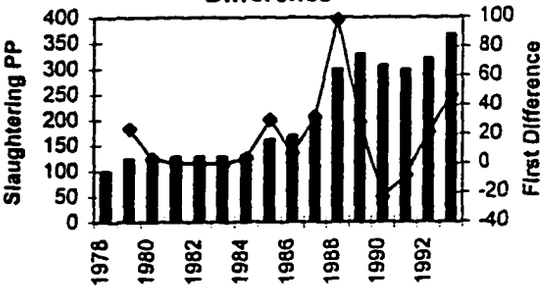



**Figure 6.23 Producer Price of Fattened Hogs, and First Difference**

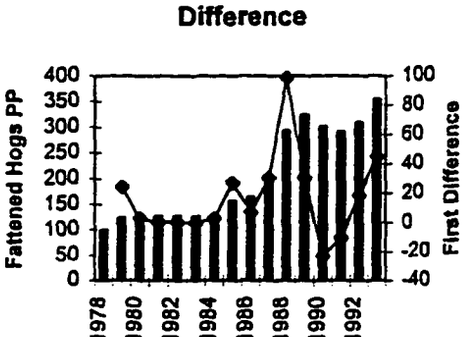



**Figure 6.24 Producer Price of Poultry Eggs, and First Difference**

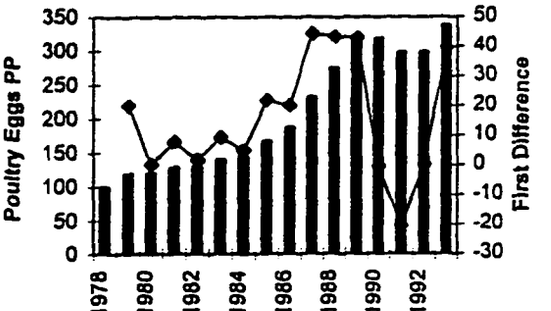


**Figure 6.25 Producer Price of Chicken Eggs, and First Difference**

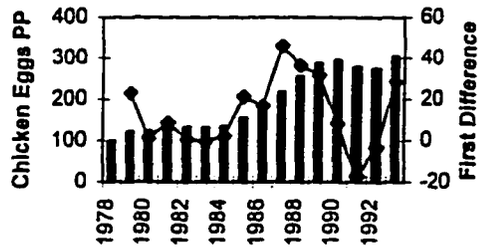



**Figure 6.26 Producer Price of Fresh Vegetables, and First Difference**

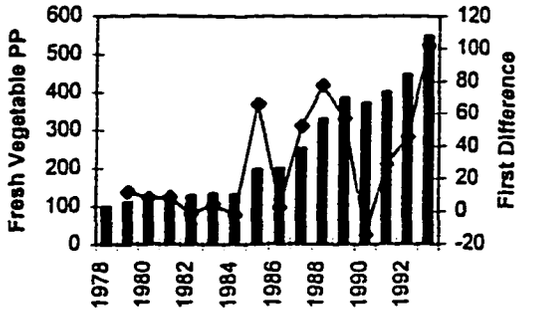
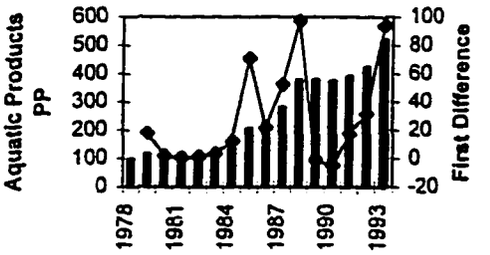



**Figure 6.27 Producer Price of Aquatic Products, and First Difference**



representation. This is why economists have shown such interest in the concept of cointegration – it provides a formal framework for testing for and estimating long-run (equilibrium) relationships among economic variables (Kennedy, 1992).

Engle and Granger (1987) demonstrate that, if ordinary least square (OLS) is employed to estimate the parameters of the cointegrating equation, then the parameters of the error correction models (ECM) can be consistently estimated, if the first stage estimates of the cointegrating equation are imposed on a second stage ECM. This "control" is implemented by including the lagged error terms from the cointegrating regression in a general ECM. The lagged residuals represent a levels term which acts to dampen short-run deviations and return the system towards the steady-state equilibrium values: an "error correction". An ECM can be developed from such economic considerations as incomplete information or prices of adjustment. This procedure is referred to as the Granger-Engle two-step procedure, and this is the basic method has been used in this econometric regression.

Engle and Granger's method is based on the Durbin-Watson statistic d of cointegration. The standard tables for this statistic cannot be used, since one is not testing whether d = 2, but rather that d is significantly positive. The null hypothesis is that price indices and aggregate variables are cointegrated. Results of Grange-Engle 2-step Durbin-Watson Test for Cointegration and the modified estimators are presented in tables 7.4, 7.5, 7.6, 7.7 and 7.8.

**General Comments**

Difference DS Impact for Commodities' pricing

I hypothesized that the impact of each DS variable on price is not the same for all commodities. This means that the coefficients of the DS factors, the β's, are not the same for all the commodities. For example, the impact of demand and supply on price does differ between rice and meat (pork). It is not surprising that the impact coefficient on price is not the same on a particular food and its related agricultural production, and food consumption patterns in a large country like China.

Because of this hypothesis, I estimate separate equations for each good, even though each commodity fits into the generalized model for each agent outlined above. Because the DS' impacts are not the same for all marketing agents, so observations on different agents, producers and consumers, could not be combined. The equations for each market level must be estimated separately.

Symmetry, Asymmetry, and Segmented Variables In studying price formation, some researchers structure their models so that they can test whether an economic agent responds differently to a price increase than to a price decrease (Garrett, 1995). In order to do this, researchers split the observations on prices into two categories, one for price increases and one for decreases. If the coefficients on the two categories are, statistically speaking, the same, economic agents are responding the same way to price increases and decreases, i.e., price formation is symmetric.

Within agricultural economists, these studies basically follow Wolffram (1971) and Houck (1977). It is important to note, however, that although the Wolfram-Houck

approach utilizes differences (price changes) in the construction of the model, the model derives from an original specification in levels. Even the dynamic, first-difference model presented by Boyd and Brosen (1988) is based on a model in levels (hence the first differences).

My study directly models the impact of economic fundamentals on price. The question, and resulting model, which I propose is straightforward: how much change in commodity price is caused by a change in economic fundamentals. In addition, in China's context almost all observations represented price increases. Therefore, in contrast to the Wolfram-Houck method, which involves summing differences in price increases and decreases, here no manipulations are necessary.

Influential Observations and Deletions I deleted explanatory variables for only one reason: it has statistically insignificant result in the regression. As will be detailed later, I began with a full model and then tested for the significance of variables. I then deleted the "insignificant" variables. This resulted in fewer variables to estimate after each round. I did revisit the influence diagnostics in each subsequent round.

Pretest Bias It is possible that the procedures used here create a pretest bias. Judge and others (1985) are particularly harsh in this criticism of these procedures, writing that

> In most cases hypothesis and specification testing are done with an eye toward estimation. This means that the final estimation ... proceeds conditionally on the hypothesis (statistical model) that has been selected. This process, which makes the model and thus the estimation procedure dependent on the test based on the data at hand, leads to ... pretest estimators. This testing mechanism leads to estimators that are inadmissible under a squared error loss measure. Little is known of the sampling properties of many of these pretest estimators and

> even less is known of the sampling properties of higher order sequential test procedures - that is, repeated tests that typically use the same set of data. Therefore, it would appear that traditional hypothesis testing procedures ... do not offer a viable way to handle the best subset problem (Judge and others 1985, 867-870).

Judge and others are probably right. Unfortunately, there are few, if any, alternatives to the procedures I have used.

**Notes on the Independent Variables**

Incorporating the DS Factors I assume that current DS conditions are the controlling factors in price formation. The slope coefficients (in effect, $\beta_i$s) are functions of contemporaneous conditions. The DS variables that explain price formation, then, are the same, with only two exceptions. They are percent change in output (which depends on technology and weather), and change in the government policy (i.e., the government intervention in the contract price). These two explanatory variables are tied to a specific price, so their values are different for each price in the equation. Here the agent, particularly, the farmers, are guided by the government's food and agricultural policies, including the procurement contract price, or by how large the output change was. The agent then tries to have a standard response to the change.

"Current" conditions may, of course, reflect demand or supply from previous periods. For example, the agent may use past experience as a guide to expectations about current conditions. The agent may also take time to adjust to new conditions. Price and income elasticities, and macroeconomic conditions are such factors.

Incorporation of Intercepts I include an intercept in ECM because DS factors, other than those I used in ECM (such as changes in wages or transportation cost), can also lead to changes in the commodity price. I do not incorporate these other factors because of the unavailability of data.

The level of these factors may have a significant effect on price formation. The changes in economic fundamentals are the primary driving forces to changes in commodity prices, although other factors may also contribute. I attempted to use the intercept to capture the effect of these other factors. To some extent, I hope that this intercept can also capture the effects of some the DS factors that were, ultimately, omitted from the estimated model because of problems with collinearity, as explained in the next section.

Collinearity. Given that there were so many potential variables to include in the models, many of which were very closely related to other variables, a primary concern in estimating the equation was Collinearity. If two or more parameters have large proportion values associated with the same principle component, then two problems can occur: the computation of the parameters is slow or nonconvergent; and the parameter estimates have inflated variances (Belsley, 1980, p.105-117). In many models, the collinearity may not be clear cut. In this study, I reformulated the models to remove the redundant parameterization when estimations do not converge.

In this study not deleting some variables leads to perfect collinearity, and I would not be able to estimate the model. I tried to decrease my level of arrogance in two principal ways. First, I deleted only those variables whose correlation was very high.

Second, I lowered the level of statistical significance at which I would delete a variable from the model. Thus, the level of "poor precision" was not the customary significance level of 0.05 or 0.10, but rather .15. This enhanced the probability that the true cause of the low level of significance was indeed that the explanatory variable did not have an effect on the dependent variable, and was not simply a result of relatively poor precision in estimation.

Specifically, I performed a two step process.

1. I ran a correlation matrix for all the DS variables alone. I deleted DS factor interaction variables with a correlation of greater than 0.95 and principal variables (that is, the stand-alone DS factors) only if the correlation between then was greater than 0.95.

2. After this first purge, I ran a correlation matrix of the actual variables (that is, the DS variables that remained multiplied by the appropriate price lags). Here, variables with a correlation of greater than 0.95 were deleted.

The justification for the different levels of correlation is that in the first matrix I was interested in seeing whether variables captured basically the same idea. I assumed that if an interaction term was correlated with a principal variable, then the principal variable probably captured the same idea as the interaction variable. Because I believed the principal variables should capture different ideas, I established a higher level of correlation before I would delete them. In the second correlation matrix, the focus was more on collinearity and whether collinearity would cause estimation problems. Thus, the higher value of 0.95 was used.

As noted, in the DF test procedure, I lowered the significance level at which I would keep a variable in the model to 0.10, rather than the standard 0.05 in my approximation. This gave a cushion by which to ensure that a variable that actually did affect the outcome was not deleted due to collinearity problems.

**Summary**

This Chapter describes the econometric specifics of the conceptual model described in Chapter Four. It explains how incorporation of the DS factors into the present value model results in a ECM. The Chapter also describes the econometric issues to consider in the estimation process.

To provide a context for the results in the next chapter, I will summarize these elements and outline the steps, that I took to derive the model. First, I took the natural log of the observations. This is the conventional way to deal macroeconomics variables, where the purpose is to get better shape in samples distribution. To develop the final estimating model, I used the DF test to test the stationarity or nonstationarity of the time series data. Then, the appropriate difference was determined by statistical tests.

Drawing on theory as well as empirical observation from the fields of economics, I identified and then, to the extent possible, quantified the economic factors that affect price formation. These factors are the determinants of the pricing coefficient, the $\beta$s, in the first model. To introduce these factors into the model, established in the first step, meant that I would need to estimate an error correlation model (ECM), as explained earlier in this chapter.

This ECM was then applied to the data. Separate models were estimated for producers, and consumers. I originally intended to incorporate all commodities at a particular marketing level into a single equation, but because of the different price and agricultural policies, this was not possible. Rather than combining all the products into one equation, which would have led to statistical bias, I simply ran the commodity's price separately, depending on which variables were important and available. At least one base model, which contains all possible variables, is estimated for each market agent, and each commodity. Chapter Seven reports the results of the application of the model to the data, and interprets the results in the light of the present value model to allow for various categories of commodity prices with different DS effects, and, possibly, different degrees of substitutability for private production and consumption.

# CHAPTER SEVEN

# RESULTS AND DISCUSSION

This chapter reports and discusses the results of the time series error correlation models for the different market agents (producer prices and consumer prices). Although the results are presented in the same way for each market agent, to avoid repetition a full explanation of the organization of a table is given only the first time the table is presented. For reference, the conceptual model is given in Chapter Four, the data in Chapter Five and the econometric model in Chapter Six.

## General Considerations in Interpreting the Results

To evaluate the soundness of my results for both the initial base distribution and the error correction models, I took three general considerations into account. First, the sign of most aggregate variables' coefficients, such as GNP growth and population growth should be positive. A negative coefficient would mean that when there is an increase in the aggregate variable, the food and agricultural commodities prices decrease, and vice versa.

Additionally, we do not expect the DS impact coefficient to be less than one. Recall that the model uses price index changes. The models estimate how much of the changes in demand and supply are passed through to cause a change in the commodity price. The impact coefficient thus represents the percentage of the DS change that is passed through. If the agent (producers or consumers) uses an additive mark-up model, then the coefficient should be exactly one. If the agent uses a percentage mark-up model, the coefficient will be less than one. However, inflationary expectations alter this calculation greatly. Measured impact would be greater than one if the marketing agent operates in an inflationary environment, and bases the commodity price on expected opportunity cost. Expectations may then lead the producer to increase commodity prices by more than the change in demand and supply.

**Results: Unit Root Tests**

To determine whether the time series data is stationary or nonstationary, I performed Dickey-Fuller test on each commodity's price index and every explanatory variable.

Univariate Properties

I examine the long-run properties of the individual variables by using two different measures: time plots and unit root tests. Time plots of the individual variables in levels and differences (Figures 6.1 - 6.6 ) strongly suggest that all of the explanatory variables are nonstationary.

The above observations are further supported by Dickey-Fuller test. The $\tau$-values and $p$-values of the Dickey-Fuller (DF) test statistics are reported in Table 7.1. The null hypothesis is that the series in question has a unit root versus the alternative hypothesis, i.e., the time series is stationary based on tables provided in Dickey (1976).

A variable is said to be integrated of order $d$, $I(d)$, when it must be differenced $d$ times to be made stationary. Thus an $I(0)$ variable is stationary. An $I(1)$ variable must be differenced once to become stationary, and so on. According to Kennedy (1992), economic variables are seldom integrated of order greater than two, and, if nonstationary, are usually $I(1)$. Thus, the DF test I applied first is for a simple unit root with a lag equals one and a constant mean. As noted in Table 7.1, some variables were $I(2)$, such as the inflation rate and investment. For those $I(2)$ variables, I conducted the DF test on their second deference with lags equal two and a constant mean (see Table 7.1, columns 6 and 7).

**Table 7.1 The Dickey - Fuller Test Results**

| Variables of Economic Fundamental | Raw Data | | 1st Difference | | 2nd Difference | |
|---|---|---|---|---|---|---|
| | τ-Value | P-Value | τ-Value | P-Value | τ-Value | P-Value |
| Corn Output | -0.28 | 0.91 | -5.18 | 0.01 | - | |
| Cotton Output estimate | -2.86 | 0.07 | -3.30 | 0.04 | - | |
| CPI | 0.52 | 0.98 | -2.38 | 0.17 | - | |
| Crop Output | -2.02 | 0.29 | -2.45 | 0.15 | - | |
| GNP | 0.26 | 0.96 | -2.74 | 0.09 | - | |
| Inflation Rate | 1.89 | 0.99 | -0.69 | 0.80 | -3.54 | 0.03 |
| Investment | 0.75 | 0.99 | -1.71 | 0.41 | -3.80 | 0.02 |
| Market Exchange Rate | -0.74 | 0.79 | -2.30 | 0.19 | - | |
| Money Supply | -0.57 | 0.84 | -4.63 | 0.01 | - | |
| National Income | 0.61 | 0.98 | -2.36 | 0.18 | - | |
| Official Exchange Rate | -0.94 | 0.72 | -2.93 | 0.07 | - | |
| Personal Consumption | -0.39 | 0.88 | -2.87 | 0.07 | - | |
| Population Growth | -0.77 | 0.78 | -2.22 | 0.22 | - | |
| Pork, Beef, & Mutton Output | -0.13 | 0.93 | -5.46 | 0.01 | - | |
| Price Index for Agricultural Producer Goods | 0.64 | 0.99 | -2.77 | 0.09 | - | |
| Rice Output | -2.06 | 0.27 | -1.98 | 0.31 | - | |
| Saving | 0.53 | 0.98 | -2.62 | 0.11 | -2.26 | 0.21 |
| Soybean Output | -0.89 | 0.74 | -2.58 | 0.12 | - | |
| Wheat Output | -1.35 | 0.56 | -2.42 | 0.16 | - | |

**Table 7.1 The Dickey - Fuller Test Results(Continued)**

| **Consumer Price** | Raw Data | | 1st Difference | | 2nd Difference | |
|---|---|---|---|---|---|---|
| | τ-Value | P-Value | τ-Value | P-Value | τ-Value | P-Value |
| Clothing | -0.02 | 0.94 | -1.62 | 0.45 | -2.97 | 0.07 |
| Food | 0.55 | 0.98 | -2.41 | 0.16 | - | |
| Fresh Vegetable | -0.36 | 0.89 | -2.78 | 0.09 | - | |
| Grain | 1.90 | 0.99 | -1.67 | 0.43 | -4.14 | 0.01 |
| Non-Staple Food | -0.26 | 0.91 | -2.72 | 0.09 | - | |
| Other Food | -2.62 | 0.11 | -3.72 | 0.02 | - | |

| **Producer Price** | Raw Data | | 1st Difference | | 2nd Difference | |
|---|---|---|---|---|---|---|
| | τ-Value | P-Value | τ-Value | P-Value | τ-Value | P-Value |
| Aquatic Products | 0.02 | 0.94 | -2.20 | 0.23 | - | |
| Chicken Eggs | -0.18 | 0.92 | -1.73 | 0.40 | -1.57 | 0.47 |
| Corn | -0.43 | 0.88 | -4.63 | 0.01 | - | |
| Cotton | -0.14 | 0.93 | -3.27 | 0.04 | - | |
| Fattened Hogs | -0.16 | 0.92 | -2.85 | 0.08 | - | |
| Fresh Vegetable | 0.38 | 0.97 | -2.27 | 0.21 | - | |
| Grain | -0.60 | 0.83 | -3.24 | 0.04 | - | |
| Livestock for Slaughtering | -0.11 | 0.93 | -2.86 | 0.08 | - | |
| Poultry Eggs | -0.17 | 0.92 | -1.92 | 0.33 | -1.29 | 0.58 |
| Rice | -0.16 | 0.92 | -2.75 | 0.09 | - | |
| Sorghum | -0.26 | 0.91 | -3.02 | 0.06 | - | |
| Soybean | -1.23 | 0.61 | -2.32 | 0.19 | - | |
| Vegetable Oil & Oil Bearing Crops | 0.25 | 0.96 | -2.55 | 0.13 | - | |
| Wheat | -0.76 | 0.78 | -3.68 | 0.18 | - | |

The pricing models are similar to those used in the usual approach to the analysis of impact of economic fundamentals in commodity pricing. This study estimates commodity price as a function of economic fundamentals. However, because of the difference in the government policy towards different commodities, and the difference in Chinese food consumption patterns, the DS impact varied among the different goods. To take this difference into account, this study estimates a separate model for each commodity, rather than combine all the observations into one model that spans the entire set of commodities. The justification for doing this relies on the notion that, the coefficients are different because of the difference in conditions facing producers and consumers. This study investigates the nature of those differences, in an attempt to provide a more satisfactory explanation for the differences in the rate of impact coefficient.

**Results: Variables in the Final Model**

For the DS variables included in the final models, Tables 7.2 and 7.3 give the expected sign of the coefficient (the $\beta$), and the actual sign of the DS variable in the regression results. Some of the variables, which were initially included in the model, were omitted due to lack of statistical significance (at the 15 percent level). Variables that were highly correlated with these variables and were also excluded. So, the variables listed here can be thought of as all the other factors that affect price formation but are not explicitly included in the model.

**Table 7.2 Producer Model**

| Variables in the Final Model | The Expected Sign of the Coefficient (β) | The Actual Sign of the DS Variable in the Regression Result (β^) |
|---|---|---|
| Consumer Price Index (CPI) | + | + |
| Growth National Product (GNP) | + | + |
| Investment | + | + |
| Money Supply | + | + |
| Personal Consumption Expenditure | + | + |
| Savings | + | + |
| Soybean Output | - | - |

**Table 7.3 Consumer Model**

| Variables in the Final Model | The Expected Sign of the Coefficient (β) | The Actual Sign of the DS Variable in the Regression Result (β^) |
|---|---|---|
| Consumer Price Index (CPI) | + | - |
| Exchange Rate (Official) | + | - |
| Fresh Vegetable Previous Price | + | - |
| Growth National Product (GNP) | + | + |
| Inflation Rate | + | + |
| Investment | + | - |
| Money Supply | + | + |
| Savings | + | + |

As noted in Chapter Six, one of the approaches I took to deal with collinearity was to remove the redundant parameterizations. The variables that continue to be included reflect not only their own "impact," but also the impact of variables with which they are correlated. A valid question is whether this consolidation masks effects in a way that leads to a misinterpretation of results. For example, national income was correlated GNP, and I excluded national income. Some of the explanatory variables were excluded due to high correlation were simply extensions or modifications of the principal variable (for example, GNP and national income). The included variables thus more or less represent the same ideas as those that were excluded. This is important because it allows us to discuss the impact of the included variable. It is representative of closely related factors and is not capturing, and covering up, the effects of radically different factors.

**The Granger and Engle test**

In determining the correct time series model, I considered a number of factors. In addition to the unit root test, I used the Grange-Engle 2-step Durbin-Watson (DW) test for cointegration. This test is based on the DW statistic d of cointegration. Note that the standard tables for DW statistic cannot be used[1], since we are not testing whether d = 2, but rather whether d is significantly positive. The null hypothesis is that price indices and aggregate variables are cointegrated. The Grange-Engle 2-step DW test Statistics for cointegration are given in (Table 7.4).

[1]. Engle and Grange (1987) provided the d values in their tables.

Table 7.4 Grange-Engle 2-step DW Test Statistics for Cointegration

| Consumer Price | DW Statistics |
|---|---|
| Clothing | 1.459 |
| Food | 1.372 |
| Fresh Vegetable | 1.845 |
| Grain | 1.683 |
| Non-Staple Food | 1.777 |
| Other Food | 1.676 |

| Producer Price | DW Statistics |
|---|---|
| Aquatic Products | 1.830 |
| Chicken Eggs | 1.061 |
| Corn | 1.492 |
| Cotton | 1.032 |
| Fattened Hogs | 1.385 |
| Fresh Vegetable | 2.141 |
| Grain | 1.293 |
| Livestock for Slaughtering | 1.432 |
| Poultry Eggs | 0.938 |
| Rice | 1.854 |
| Sorghum | 1.728 |
| Soybean | 1.703 |
| Vegetable Oil & Oil Bearing Crops | 1.850 |
| Wheat | 1.902 |

For both the Producer and Consumer Models, the DW test can not reject the null hypotheses, i.e., there is cointegration at the 5 percent level of significance. Given that the Granger-Engle 2-step DW statistic suggests that there is a cointegration, I use ECM to obtain the best possible results.

## Results: The Impact of Demand and Supply on Price Formation

Producer Model

$$\Delta P_{t,\ producer} = f\,(P_{t-1,\ producer}\ ,\ DS\ factors,\ error\ correction\ terms) \qquad (7.1)$$

where the error correction term is the lagged residuals from the OLS regression in the cointegrating equation. The lagged residuals act to dampen short-run deviations and return the system towards the steady-state equilibrium values (Engle and Granger, 1987).

The above model contains fourteen goods chosen for analysis. To give an idea of price trend for each commodity, the price increases, has in the producer model, figures 6.13-6.27 give time plots of the observations from each of these goods. The number actually used is one less than the total given because one observation is used to form the differenced observation. Figures 6.7-6.12 also presented similar time plots for the consumer models.

The expected direction of the impact of a demand and supply variable often depends on whether the commodity price is set freely by market or under the government control. Some confusion may result in the actual sign of the DS variable in the regression result. The impact of the same DS variable may differ depending on whether the price is set up by market or under the government control, as well as the consumption . patterns (see Table 7.2, column 3).

Table 7.5 reports the results for the producer pricing models, so the explanation given here will not be repeated in the later sections. Table 7.5 also provides information on the contribution of each DS factor to price formation. It is important to note that the contribution of a DS factor to the overall pricing is the value of the parameter (that is, the $\beta$).

Table 7.5 OLS Regression Results on 1st Difference (Producer Models)

| *Dependent Variable* | **Independent Variables** | | | | |
|---|---|---|---|---|---|
| | Intercept | GNP | Investment | Adj. R-SQ | F-test |
| *Aquatic Products* | -0.2594 | 4.5350 | -0.5759 | 0.7341 | 0.0003 |
| | (0.0626) | (0.7390) | (0.1409) | | |

| | Intercept | GNP | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Chicken Eggs* | -0.0647 | 1.4994 | 0.2746 | 0.0315 |
| | (0.0562) | (0.6162) | | |

| | Intercept | CPI | Savings | Adj. R-SQ | F-test |
|---|---|---|---|---|---|
| *Cotton* | -0.0837 | 1.4737 | 0.3156 | 0.6721 | 0.0009 |
| | (0.0354) | (0.2045) | (0.1315) | | |

Note: * The number in parentheses are standard deviations.

* The number above parentheses are the estimated coefficients.

Table 7.5 OLS Regression Results on 1st Difference (Producer Models, continued)

| *Dependent Variable* | **Independent Variables** | | | |
|---|---|---|---|---|
| | Intercept | Investment | Adj. R-SQ | F-test |
| *Corn* | 0.0420 | 0.4799 | 0.6486 | 0.0003 |
| | (0.0156) | (0.0960) | | |

| | Intercept | GNP | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Fattened Hogs* | -0.1223 | 2.2852 | 0.2763 | 0.0311 |
| | (0.0854) | (0.9359) | | |

| | GNP | Adj. R-SQ | F-test |
|---|---|---|---|
| *Fresh Vegetable* | 2.4911 | 0.3141 | 0.0217 |
| | (0.9447) | | |

Note: * The number in parentheses are standard deviations.

* The number above parentheses are the estimated coefficients.

Table 7.5 OLS Regression Results on 1st Difference (Producer Models, continued)

| *Dependent Variable* | **Independent Variables** | | | | |
|---|---|---|---|---|---|
| | Intercept | Personal Consumption | GNP | Adj. R-SQ | F-test |
| *Grain* | -0.0501 | 0.4337 | 1.2408 | 0.7739 | 0.0001 |
| | (0.0316) | (0.0875) | (0.3526) | | |

| | GNP | Adj. R-SQ | F-test |
|---|---|---|---|
| *Livestock for Slaughtering* | 2.2726 | 0.2866 | 0.0282 |
| | (0.9110) | | |

| | Intercept | GNP | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Poultry Eggs* | -0.0794 | 1.7766 | 0.4328 | 0.0063 |
| | (0.0491) | (0.5376) | | |

Note: * The number in parentheses are standard deviations.

* The number above parentheses are the estimated coefficients.

Table 7.5 OLS Regression Results on 1st Difference (Producer Models, continued)

| *Dependent Variable* | **Independent Variables** | | | |
|---|---|---|---|---|
| | Intercept | Investment | Adj. R-SQ | F-test |
| *Rice* | 0.0476 | 0.4281 | 0.3957 | 0.0095 |
| | (0.0221) | (0.1388) | | |

| | Intercept | Investment | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Sorghum* | 0.0618 | 0.3685 | 0.3292 | 0.0187 |
| | (0.0216) | (0.1356) | | |

| | Intercept | Money Supply | Soybean Output | Adj. R-SQ | F-test |
|---|---|---|---|---|---|
| *Soybean* | 0.0562 | 0.4657 | -0.3869 | 0.7227 | 0.0003 |
| | (0.0245) | (0.1390) | (0.1197) | | |

Note: * The number in parentheses are standard deviations.

* The number above parentheses are the estimated coefficients.

Table 7.5 OLS Regression Results on 1st Difference (Producer Models, continued)

| *Dependent Variable* | **Independent Variables** | | | |
|---|---|---|---|---|
| | Intercept | Investment | Adj. R-SQ | F-test |
| *Vegetable Oil & Oil Bearing Crops* | 0.0422 | 0.2689 | 0.2616 | 0.0356 |
| | (0.0180) | (0.1136) | | |

| | Intercept | Personal Consumption | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Wheat* | 0.0310 | 0.4284 | 0.4925 | 0.0031 |
| | (0.0148) | (0.1161) | | |

Note: * The number in parentheses are standard deviations.

* The number above parentheses are the estimated coefficients.

The contribution of all other factors (AOFs) to pricing is of course, represented by the intercept in the model. I kept these "intercepts" as separate variables until, by my criterion (significant at a level of 0.15), all other remaining variables were statistically significant. I tested to see if these "intercepts" were statistically significant. If these "intercepts" were equal to zero, then the contribution of AOFs to price formation would be zero. Except for random disturbances, then, the included DS factors would fully explain price formation.

An incorrect sign on a DS variable implies that its contribution to the price formation is wrong. The coefficient must then be interpreted with care. Nevertheless, it is hoped that the "wrong-signed" effects more or less cancel each other to produce a price formation coefficient that is more or less correct.

I reported the adjusted $R^2$ for the OLS estimation. Note, the $R^2$ for the OLS is calculated correctly, but it is not based on the most efficient model. That $R^2$ is based on a transformed regression, not the true model of interest.

Table 7.5 shows the results of the OLS model for producers, and Table 7.6 shows the results of the Grange-Engle 2-step Regression for producer pricing (ECM). Although the impact is illogically high for a price increase, most of the DS variables have the expected signs, and their individual impacts are reasonable in the final results, that is in the ECM model. Most measured impacts are greater than one, because the producers operate in an inflationary environment, and base their commodity prices on expected opportunity costs. These expectations lead the producer to increase commodity prices by more than the change in demand and supply. The F-test confirms the general hypothesis

Table 7.6 Results of ECM (Producer Models)

| *Dependent Variable* | **Independent Variables** | | | | |
|---|---|---|---|---|---|
| | Intercept | GNP | Investment | Adj. R-SQ | F-test |
| *Aquatic Products* | -0.2241 | 4.0894 | -0.4971 | 0.7441 | 0.0007 |
| | (0.0681) | (0.8150) | (0.1531) | | |

| | GNP | Adj. R-SQ | F-test |
|---|---|---|---|
| *Chicken Eggs* | 0.9267 | 0.278 | 0.0665 |
| | (0.8296) | | |

| | Intercept | Savings | CPI | Residual | Adj. R-SQ | F-test |
|---|---|---|---|---|---|---|
| *Cotton* | -0.0583 | 0.2742 | 1.1506 | -0.4437 | 0.7323 | 0.0009 |
| | (0.0348) | (0.1209) | (0.3100) | (0.2380) | | |

| | Intercept | Investment | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Corn* | 0.0407 | 0.5245 | 0.6567 | 0.0011 |
| | (0.0155) | (0.1027) | | |

| | GNP | Residual | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Fattened Hogs* | 1.5536 | -0.3317 | 0.3189 | 0.0483 |
| | (1.0631) | (0.2508) | | |

| | GNP | Residual | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Fresh Vegetable* | 1.5815 | -0.5646 | 0.4417 | 0.0162 |
| | (0.9734) | (0.2918) | | |

| | Personal Consumption | GNP | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Grain* | 0.4057 | 1.178 | 0.7766 | 0.0004 |
| | (0.0909) | (0.3555) | | |

Note: * The numbers in parentheses are standard deviations.
* The numbers above the parentheses are the estimated coefficients.

Table 7.6 Results of ECM (Producer Models, continued)

| *Dependent Variable* | **Independent Variables** | | | |
|---|---|---|---|---|
| | GNP | Residual | Adj. R-SQ | F-test |
| *Livestock for Slaughtering* | 1.5679 | -0.3452 | 0.3368 | 0.0417 |
| | (1.0157) | (0.2499) | | |

| | GNP | Adj. R-SQ | F-test |
|---|---|---|---|
| *Poultry Eggs* | 1.4667 | 0.4078 | 0.0224 |
| | (0.7047) | | |

| | Intercept | Investment | Residual | Adj. R-SQ | F-test |
|---|---|---|---|---|---|
| *Rice* | 0.0454 | 0.517 | -0.2382 | 0.4821 | 0.0107 |
| | (0.0205) | (0.1384) | (0.1375) | | |

| | Intercept | Investment | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Sorghum* | 0.0602 | 0.423 | 0.3037 | 0.0545 |
| | (0.0221) | (0.1562) | | |

| | Intercept | Money Supply | Residual | Adj. R-SQ | F-test |
|---|---|---|---|---|---|
| *Soybean* | 0.0376 | 0.6194 | -0.8248 | 0.8429 | 0.0001 |
| | (0.0194) | (0.1160) | (0.2689) | | |

| | Intercept | Investment | Residual | Adj. R-SQ | F-test |
|---|---|---|---|---|---|
| *Vegetable Oil & Oil Bearing Crops* | 0.0395 | 0.3576 | -0.2823 | 0.4254 | 0.0189 |
| | (0.0160) | (0.1087) | (0.1343) | | |

| | Intercept | Personal Consumption | Adj. R-SQ | F-test |
|---|---|---|---|---|
| *Wheat* | 0.02953 | 0.4657 | 0.4668 | 0.0126 |
| | (0.0154) | (0.1321) | | |

Note: * The numbers in parentheses are standard deviations.
* The numbers above the parentheses are the estimated coefficients.

The results confirm that demand and supply variables affect price formation. Specifically, they confirm the importance of the percent change in GNP, inflation rate, personal consumption, money supply, investment in the change of food, and agricultural products' pricing. Harvest, the output, does not seem to have large effect on pricing.

Free market products are generally small farmer products, such as fresh vegetables, aquatic products, chicken eggs, and livestock for slaughtering. For those products producer prices probably only respond to demand and supply when producers actually have something to sell and so participate in the market. For other crops producers of grain, wheat, corn sorghum, soybean, vegetable oil and oil bearing crops, and cotton are more aware of government intervention. These producers often contract to sell the entire season's production at a fixed price. They usually negotiate this price a few months before harvest for the harvest period based on indications from the demand and supply in the market. Consequently, although fixed for the season, the price primarily affects producers only during harvest.

As described in Chapter Six, there are differences in price formation among the products, also, there are differences in the impacts of either excluded or included factors among the products. Because of different government food policy, I divided the consumer goods into two groups, those with a semi-market price and those with a free market price. Although the reason for the division had to do with what the government's pricing policies, it turned out that the first group contained only traditional products and

unprocessed goods, while the second contained mostly non-traditional products and processed products.

**Semi-market Setting Price Goods**:

The factors for this group of goods differ from those for the other products, because they are traditional products, and they are under the heavy government intervention. The price coefficients are less than one, except grain's pricing. Because of the government intervention in the pricing, the producers are only allowed to use a percentage mark-up model. This model causes the coefficient to be less than one.

Grain: The inclusion of grain is general information. I estimated grain in a separate equation. Tables 7.5 and 7.6 report the results. In spite of the fact of government intervention as discussed above, it is really surprising that the parameters have the expected positive sign for personal consumption and GNP. GNP's impact on pricing is a little bit greater than one. This implies that the market condition facing the producers has changed, and they can use expectation in their pricing. This finding is consistent with the observed policy changes in government purchasing of grain. The F-test confirms that the DS factors belong in the model.

Wheat: For wheat, results are shown in Tables 7.5 and 7.6. The results appear to confirm those of the producer pricing model. The impacts of AOFs are positive, and the personal consumption's coefficients is positive, too. The F-test on the DS factors indicates that they are significant. This may be because, compared to the other models, the model has only a few degrees of freedom.

Rice, Corn, Sorghum, Vegetable Oil & Oil Bearing Crops: The results are similar to those of the producer pricing model. Tables 7.5 and 7.6 report the results. These goods probably share some characteristics and I grouped these products together for analysis. The impacts of AOFs and investment are positive. The F-test show that the DS factors are important for explaining the price formation.

Soybean: For soybean, the result is reported in Tables 7.6 and 7.7. The impacts of AOFs and money supply are positive. As I expected, the impact of soybean output is negative. The F-test on the DS factors indicates that they are significant.

Cotton: From the regression results in Tables 7.5 and 7.6, we can see that the impacts of savings and CPI are positive, while the combined impact of AOFs are negative. However, the overall impacts of pricing coefficients are positive. The F-tests show that the DS factors are important for explaining the price formation.

**Free Market Setting Price Goods**

Livestock, Fattened Hogs, Poultry Eggs, Chicken Eggs, Fresh Vegetable, and Aquatic Products: Tables 7.5 and 7.6 report the results. These goods' prices are set by free market. They probably share some characteristics and I grouped these products together for analysis. The impact of GNP is positive for all of them. For aquatic products' prices, the impacts of AOFs and investment are negative, but the overall impact on the price coefficient is positive. Most of the price coefficients are greater than one. Note that for Chicken eggs, the coefficient is .9267, because the producers operate in an inflationary environment, and base the commodity price on expected

opportunity cost. Expectations then lead the producer to increase commodity prices by more than the change in demand and supply. The F-test show that the DS factors are important for explaining the price formation.

Concluding Comments These results confirm that demand and supply are important to price formation. They also identify which factor is the most important, and quantify the impacts of those factors. The estimated coefficients are reasonable and they do have positive sign, as expected (Tables 7.5 and 7.6). The price formation coefficient is consistent with the underlying hypotheses for most goods. The table also indicates the other influences that these variables may reflect.

From the regression results, the explanatory variables (such as the changes in GNP, personal consumption, investment, money supply, savings, CPI and soybean output), seem to have significant impact on price formation. This provides strong support for the specific hypotheses about the contribution of the DS to price formation. Furthermore, the F-test shows that the DS variables do belong in the model.

Consumer Model

$$\Delta P_{t,\,\text{consumer}} = f\,(P_{t-1,\,\text{consumer}}\,,\ \text{DS factors, error correction terms}) \qquad (7.2)$$

Here again, the error correction term is the lagged residuals from the OLS regression in the cointegrating equation. The lagged residuals act to dampen short-run deviations and

return the system towards the steady-state equilibrium values (Engle and Granger, 1987).

I estimate the impact of DS factors in the consumer pricing for each good in the same way of that in producer pricing model. Because of different government food policy, I divided the consumer goods into two groups: semi-market price and free market price. It turned out that the first group contained only one unprocessed good: grain; while the second contained processed products: food, non-staple food, other food, clothing and fresh vegetables.

Most of the price formation coefficients are consistent with the hypotheses. With one exception, the explanatory variable of official exchange rate's sign is negative. The negative sign of the impact coefficient for official exchange rate is due to government intervention, which makes home country consumer price less responsive to international price changes. Import price increases, for example, are not passed to the consumer price, because the price is fixed.

Processed Products: Some products for consumers are processed, such as food, clothing, nonstaple food, and other food. I grouped them together to report their estimation results. The results of OLS regression on first difference for this model are given in Table 7.7, and the estimated coefficient from ECM are given in Table 7.8.

Table 7.7 OLS Regression Results on the 1st Difference (Consumer Models)

| *Dependent Variable* | **Independent Variables** | | | | |
|---|---|---|---|---|---|
| | Intercept | Inflation Rate | Official Exchange Rate | Adj. R-SQ | F-Test |
| *Clothing* | -0.0199 | 0.7014 | -0.1255 | 0.7477 | 0.0002 |
| | (0.0157) | (0.1133) | (0.0755) | | |

| | Intercept | GNP | Adj. R-SQ | F-Test |
|---|---|---|---|---|
| *Food* | - | 1.3964 | 0.3968 | 0.0094 |
| | | (0.4518) | | |

| | Intercept | GNP | Savings | Investment | Fresh Vegetable Previous Price | Adj. R-SQ | F-Test |
|---|---|---|---|---|---|---|---|
| *Fresh Vegetable* | -0.2525 | 4.2025 | 0.4055 | -0.4038 | -0.6242 | 0.8461 | 0.0002 |
| | (0.0509) | (0.4921) | (0.1099) | (0.0852) | (0.1385) | | |

| | Intercept | Inflation Rate | CPI | Money Supply | Adj. R-SQ | F-Test |
|---|---|---|---|---|---|---|
| *Grain* | -0.0419 | 1.6491 | -1.3328 | 0.2123 | 0.8675 | 0.0001 |
| | (0.0190) | (0.1881) | (0.2604) | (0.0579) | | |

| | Intercept | GNP | Savings | Adj. R-SQ | F-Test |
|---|---|---|---|---|---|
| *Non-Staple Food* | -0.3660 | 2.2099 | 1.0250 | 0.6519 | 0.0033 |
| | (0.1048) | (0.4505) | -0.2926 | | |

| | Intercept | Inflation Rate | Adj. R-SQ | F-Test |
|---|---|---|---|---|
| *Other Food* | 4.6229 | 0.4639 | 0.2388 | 0.0437 |
| | (0.0260) | (0.2058) | | |

Note: * The numbers in parentheses are standard deviations.
* The numbers above the parentheses are the estimated coefficients.

Table 7.8 Results of ECM (Consumer Models)

| *Dependent Variables* | **Independent Variables** | | | | |
|---|---|---|---|---|---|
| | Official Exchange Rate | Inflation Rate | Residuals | Adj. R-SQ | F-Test |
| *Clothing* | -0.1732 | 0.7503 | -0.4541 | 0.7849 | 0.0003 |
| | (0.0751) | (0.1085) | (0.2665) | | |

| | GNP | Residuals | Adj. R-SQ | F-Test |
|---|---|---|---|---|
| *Food* | 1.1417 | - | 0.4097 | 0.022 |
| | (0.5012) | | | |

| | Intercept | GNP | Savings | Investment | Fresh Vegetable Previous Price | Adj. R-SQ | F-Test |
|---|---|---|---|---|---|---|---|
| *Fresh Vegetable* | -0.2917 | 4.679 | 0.4828 | -0.4454 | -0.7742 | 0.8356 | 0.0008 |
| | (0.0796) | (0.8880) | (0.1639) | (0.1086) | (0.2703) | | |

| | Intercept | Inflation Rate | CPI | Money Supply | Residuals | Adj. R-SQ | F-Test |
|---|---|---|---|---|---|---|---|
| *Grain* | -0.0325 | 1.3626 | -0.9405 | 0.1851 | -0.8586 | 0.9347 | 0.0001 |
| | (0.0136) | (0.1572) | (0.2169) | (0.0414) | (0.2555) | | |

| | Intercept | GNP | Savings | Adj. R-SQ | F-Test |
|---|---|---|---|---|---|
| *Non-Staple Food* | -0.28 | 1.7992 | 0.8721 | 0.645 | 0.0079 |
| | (0.1427) | (0.6449) | (0.3411) | | |

| | Intercept | Inflation Rate | Adj. R-SQ | F-Test |
|---|---|---|---|---|
| *Other Food* | 4.6314 | 0.3822 | 0.1953 | 0.1208 |
| | (0.0303) | (0.2525) | | |

Note: * The numbers in parentheses are standard deviations.
* The numbers above the parentheses are the estimated coefficients.

Because these are processed products, we might expect to get odd results. Conceivably, there are processing costs involved in the pricing. The total contributions of the DS factors to price formation, however, are well within a reasonable range. Overall, as in the consumer pricing model, the impacts of DS are reasonable.

As in the consumer pricing model, the DW statistics indicate that the error correction models are appropriate. The F-test indicates which of the explanatory variables are in the model, i.e., official exchange rate, inflation rate, GNP, CPI, savings, investment, money supply and previous price index.

The results confirm the hypotheses of the effects of a change in DS. Most of these processed goods have a high price impact coefficient. There are at least two possible reasons for this. First, there are processing costs involved in the pricing. Second, food processing manufacturers and individual venders that have the capital and know-how to process goods may also have greater knowledge of DS, so they are more likely to use this information to form their expectation on prices.

Food: The regression results reported in Tables 7.7 and 7.8 show that in spite of heavy government intervention, the GNP's impact on pricing is greater than one. The factor of expectation seems present in the price formation. The F-test indicates that the DS factors belong in the model.

Grain: From the results in Tables 7.7 and 7.8, we can see the impact of the inflation rate is positive. The impact of CPI is negative, because the government has to enforce

price control when the city dwellers complain the price is too high for their daily vegetable and food baskets. In addition, the money supply has positive impact on grain's price. The F-test strongly suggests that the DS factors belong in the model.

Clothing: The sign of the coefficient for the official exchange rate is negative, which seems inconsistent with the underline hypothesis. It may be caused by correlation among the explanatory variables. An alternative explanation may be that industrialization lowers the production cost. In addition, the coefficient of inflation rate is less than one. The price of clothing is set up by DS in the market without the government intervention. Producers use a percentage mark-up model, because of the consumption patterns in China resulting in a coefficient is less than one. People do not spend as much money on clothing as they do on food and vegetables (see Tables 5.1, column 2 and row, 9; Tables 5.2, column 2 and row, 7 ). The F-test suggests that the DS factors belong in the model.

Non-staple Food: The coefficients of both GNP and savings are positive, and indicate that producers base their pricing on the expectation. AOF's impact is negative. The F-test indicates that the DS factors belong in the model.

Fresh Vegetables: The coefficient of both GNP and savings are positive. The impacts of investment and previous fresh vegetable price level are negative. The results are consistent with the market condition in China, because fresh vegetables' prices are mostly set by free markets, except when city residents strongly complain of high prices. The government then intervenes and controls the prices of the vegetable baskets. The F-test indicates that the DS factors belong in the model.

Other Food: It belongs to the group of free market price goods. The impact of the inflation rate played a major role in the price formation. The coefficient is less than one. However, the impact of AOFs seems very strong. The F-test seems to indicate that OLS regression has a better result.

Concluding Comments Demand and supply have different impacts on different commodity price formation. It has something to do with the Chinese people's consumption pattern. It also has some correlation with government intervention for the believe that the producers were charging a high price, or for the reason to matching the urban residence's income level for social stability.

**Summary**

This study found that demand and supply explain price formation in a transitional economy like China. The price formation coefficient is not the same for all the commodities.

Both types of factors (demand and supply) affect the price formation at the producer and consumer level. Economic factors, especially the rate of inflation, might dominated the other factors as explanatory variables in the consumer pricing. In most regressions, the GNP seems to be the dominate explanatory variable in both producer and consumer pricing models. This result is probably at least partially due to two factors: (I) a lack of data on other economic fundamental variables, which makes it difficult for econometric techniques to identify their influence, and (2) the correlation between the included and excluded factors, which often led to the exclusion from the

econometric estimation of variables that might actually influence price formation. The findings for the producer and consumer pricing are clear. F-tests of whether the DS factors belong in the model is highly significant in most of the models. The explanatory value of the demand and supply factor is clear. The results suggest that demand and supply factors are important in explaining price formation, and they are robust enough to rely on them for identifying some factors specifically.

With such aggregate level variables, the possible imprecision of the estimates is a concern, but the models hold up well. Nonstationarity and cointegration seem to be problems, but the first order difference and error correction models seem to take care of the problems fairly well. The following chapter examines the policy implications of these findings and suggests avenues for future research.

# CHAPTER EIGHT

# CONCLUSIONS, POLICY IMPLICATIONS, AND FUTURE RESEARCH

There are many studies on price reform, but none of them combined their research with agricultural development and reform, and none of their quantitative analyses tried to explain pricing with economic fundamentals. Surprisingly, many economists and policymakers around the world have not recognized the importance of a productive agricultural system in the socialist transition process.

While focusing on price reform in the food and agricultural markets, this study examined the political and economics of evolution in food and agricultural markets in China from 1949 to 1993. In addition, this study directly tests hypotheses about the economic laws of commodity price formation in a China's transitional economy. By synthesizing work from demand and supply, this study formulated and tested hypotheses about economic factors that affect price formation. This original quantitative study has explored the limit of the present value model in China's context. The results confirm that price formation is a function of economic fundamentals, and is dependent on demand and supply. A time series error correction model is one way to acknowledge this fact. The results suggest an appropriate way to structure the econometric estimation. Of

course, a deeper understanding of the effect of demand and supply on price formation for each good (as opposed to mere quantitative representations) is critical when investigating price reform (Garrett, 1995). In an analysis of price reform, the present value model should be preferred over models that assume that international prices always indicate the true cost (or benefit) of a resource to a nation's economy.

**Conclusion**

This study found that the pragmatic and economic reforms in agriculture raised the income of the peasants. The reforms also increased savings in the rural sector and tax revenues to the government for infrastructure. Finally, it stimulated demand for industrial products. Because of a rising agricultural productivity, labor was released from agriculture. The "peasant capitalism" entirely replaced the collectivism. Food supply was increased for the rising urban population. The rising agricultural productivity brought the most durable reform and the strong overall economic growth in China. Above all, the agricultural reform changed the Soviet pricing system in the food and agriculture markets, that resulted in almost complete price decontrolled in the food and agricultural markets. These markets, with their increasing capability of power to signal relative scarcities and opportunities, have become the chief guiding force for resource allocation.

Perhaps one of the most surprising conclusions of this research is that agricultural reform facilitated price reform. The agricultural reform brought changes in the market conditions facing producers and consumers, and altered the structure of the overall economy. Any impact of demand and supply on price formation came from the

aggregate economic fundamentals, such as the GNP and aggregate personal consumption expenditure. The statistical results confirmed that the economic fundamentals identified by this study were determinants of price formation. Consequently, the price reform affected not only the explanatory power of the economic fundamentals, but also the structure of economy through expanding the free market function in the value of trade of agricultural products as well as the guidance of peasants' production decisions. It was shown that price reform did increase market efficiency in the sense of allowing peasants to "see" the "right price."

This result also demonstrates that despite heavy government intervention under authoritarian regimes, Chinese food and agricultural product prices do follow variations in demand and supply similarly to commodity prices in developed countries. Chinese peasants are often isolated from international markets. They do not have the ownership of their land. However, although their production decisions were heavily influenced by government policy, they acted much like profit maximizers in the developed countries. As individual peasants, they have limited political power, but they changed the structure of the economy through their economic activities. In 83,000 free markets, the transaction volume soared from ¥13 billion in 1978 to ¥5,343 billion in 1993, a 42,300% increase with 15 years.

The share of agricultural output sold through the market rose from less than one tenth in 1978 to almost half in 1993. The number of Township and Village Enterprises (TVEs) soared from 1.5 million (28 million employees with ¥49.3 billion output) in 1978 to 24.5 million (with total of 123.5 million jobs and a ¥3.2 trillion output) in 1993. The

rapid growth of TVEs significantly reduced the share of the state in the gross value of total industrial output from more than three quarters in 1978 to less than half by 1991 (Perkins News Week, 1991). TVEs also played a significant and increasing role in other sectors, such as construction, transport and wholesale and retail trade. By 1991 the state's overall share of GNP was no more than 25 percent.

The outstanding success of the China's economic pragmatism oriented reform has given rise to a new perspective on the introduction of agricultural development and its role in the transformation of centrally planned economies. The Chinese experience, in particular, stands in sharp contrast to the more ambitious reform strategies of the countries of Central and Eastern Europe and the former Soviet Union. In many areas, the Chinese Government did not start out with a comprehensive blueprint, nor did it have in mind any particular sequence of reforms. More often than not, the dynamics of the initial reform measures generated forces that led to further reform, a process that is continuing to the present day.

**Policy Implications**

Given the rapid development of the China's economy in recent years and its approach to reform, a number of fundamental issues arise which have far-reaching policy implications. Particularly significant are those which appear to be contrary to mainstream economic thinking.

* China has shown that it is possible to achieve higher growth by taking advantage of the agricultural reform between central planning and the market, and between collective

ownership and the market oriented land lease. It resulted in a complete replacement of the collective system by the peasant capitalism system. But, in China -- unlike Eastern Europe -- the reforms were not preceded by collapse of the political system.

* The "gradual" approach to market reforms has been strongly denounced as impracticable for the transition from a centrally planned to a market oriented economy by those in favor of a simultaneous and comprehensive or "big bang" transformation (World Bank, 1993 Trade and Development Report). Comparison of the Chinese experience with that of other countries, however, suggests that there may be considerable advantages in a gradualist approach;

* A great deal of marketization has so far been accomplished in China without formal privatization of state ownership. The government has made clear its preference for state ownership of the principal means of production. It is the agricultural reform, with its relatively little private ownership of land and capital, accomplished the extensive and widespread marketization. Thus, agricultural development and reforms are the crux for markets to operate relatively efficiently. In place of clearly assigned individual property rights, policy measures were devised to change the system incentives of individual peasants, which resulted in a completely de-collectivization;

* Although there are some side effects, the creation of town and village enterprises (TVEs) has been a particular achievement. They represent an entirely new organizational form that is unique in that they are able to behave according to the rules of the market.

* In spite of its evident drawbacks the dual price system, which is regarded as leading to inefficiency in conventional theory, has served evidently to diminish gradually the role of

price control in favor of a growing predominance of market prices. As part of China's price stabilization programs, the dual price system benefited China by allowing it to avoid the current traumatic political and societal experiences of many of the transition economies. One of the side effects of the dual price system is that it created opportunities for those with access to supplies at state prices to enjoy substantial windfall gains by reselling them on the market;

* Close integration with the world economy is considered by conventional theory as essential for fast growth. In spite of its open door policy, however, China is very far from being closely integrated with the world economy. It has aimed at "strategic" rather than complete integration. To that end, it has continued to maintain a plethora of controls on imports and on capital movements. It has not reached the ultimate targets of a fully convertible currency, nor resumption of its status as a contracting party of General Agreement on Tariffs and Trade (GATT).

* By the late 1980s, not only were profits becoming more important as a determinant of resource allocation but international prices were increasingly being passed through to the domestic market, making the government increasingly aware of the importance of avoiding an overvalued exchange rate. Exporters were also allowed to retain a portion of their foreign exchange earnings to pay for their imported inputs. The government also established foreign exchange adjustment centers or "swap markets" to make foreign exchange available initially to foreign investors, and finally also to domestic firms. In addition to measures to increase the convertibility of the Chinese currency, repeated

devaluation has lowered the real effective exchange rate to about one quarter of its pre-reform value (see column 6 in Table 3.2).

* Following reforms in agriculture, reforms were introduced in 1984 and 1987 in the industrial sector. The extent of success, so far, can perhaps be more appropriately assessed once again with reference to agricultural development. Reforms are inherently inflationary, since they require adjustments in relative prices. In practice this means that average prices are certain to rise, particularly in the food and agricultural markets, because the prices were set up too low by the Soviet system. In China, strong inflation has emerged on more than one occasion, and has led to the imposition of austerity programs in a few cities.

* The condition of availability of goods in the market has been fulfilled to a large extent. There was no elaborate decision to abolish state allocation, but ever fewer goods, both intermediate inputs and final products, were made available through the state as the share of the market rose steadily. From 1982 to 1991, the number of producer goods distributed through the state plan fell from 837 to only 20. (Lu , Liu, Tang, Tidrick and Chen, eds. 1992) Similarly, the total number of different kinds of material and equipment under a substantial degree of state control in 1990 was only 72, as compared to nearly 300 in 1988 (China Daily, 4 December 1990, p.1).

**Further Research**

Although this research confirmed and quantified the importance of demand and supply factors, some variables that were potentially significant were omitted from the

estimation, largely because of problems of collinearity. Improvements in the data may allow testing of the impact of these variables.

Data quality and quantity may have affected the results. Data-gathering procedures were not always optimal in this study, and many of the variables were not always available, because they are considered state secrets by the Chinese government. The possibility of the existence of endogenous variables is one of the concerns about the reliability of the results. Even so, it is important to note that the focus of this research was to model market structure while examining the rate and magnitude of DS' impact on price formation.

With regard to specific models, the producer model performed very well. The consumer model performed reasonably well. If data allowed, a case could be made for the Hausman test by using the all available exogenous variables to predict the endogenous variables, and using instrumental variable reestimating the models to see if results improve.

One of the original goals of this research estimation of the impact of differential structures of price reform on dynamic income distribution and welfare was not pursued in much detail in this study. Future research should explore this relationship further. This research at least tentatively suggests that, because the rates of price reform are faster than those of wage adjustment, a negative impact might occur to lower and moderate income Chinese.

Similar questions should be investigated with regard to agricultural producers. Producer prices may not rapidly reflect changes in demand and supply, so changes in

revenue may lag behind rises in costs of production. If peasants do not have access to credit to cover these rising costs of production, production levels and producer revenue may be negatively affected.

Additionally, it would be interesting to examine the correlation of changes in producer prices to agricultural farmers' income, especially as they relate to changes in food prices. The slow change in peasants' income would have a negative impact on agriculture development if the costs of production, especially food and housing, rise relatively more rapidly.

Finally, one of the underlying, unexamined assumption of this research is that rapid price reform, and in turn, economic reform is by its very nature, good. This is not necessarily the case. Some groups in society might be hurt by rapid changes in some production or rising food costs. They might also lack coping or insurance mechanisms to protect themselves against such rapid change. It is also important to note that a lack of rapid reform is not by itself a cause for concern. Markets may be working as efficiently as possible even if reform is slow. Because of limited capital, limited arable land, and a huge population, 65 million people still do not have enough food to eat, nor enough clothing to keep them warm (*The People in the Old Zone should never be forgotten*, People's Daily Overseas Edition, Sept. 24, 1996, p1).

## REFERENCES


Adam, Jan. (1989). Economic Reform in the Soviet Union and Eastern Europe Since the 1960s. London: MacMillan.

Agbeyegbe, Terrence D. (1993). The Stochastic Behavior of Mineral Commodity Prices. In Models, Methods, and Applications of Econometrics: Essays in Honor of 115 A.R.Bergstrom. Cambridge, MA: Blackwell.

Ahn, Byung-Joon, (1989). Political Economy of Reform in China, In by Gomulka, Stanislaw, Yong-Chool Ha and Cae-One Kim Armonk (Eds), Economic Reforms in the Socialist World. New York: M.E. Sharpe, Inc.

Arthur, W.B. (1988). Self-Reinforcing Mechanisms in Economics. In Anderson, P.W. Arrow, K.J. and Pines, D. (Eds), The Economy as an Evolving Complex System Reading. MA: Addison-Wesley.

Belsley, D.A., Kuh, E. and Welsch, R.E. (1980). Regression Diagnostics, New York: John Wiley & Sons, Inc.

Bettelheim, C. (1978). The Transition to Socialist Economy, Sussex, Harvester Press.

Bornstein, M and Fusfeld, D.R. (Eds), (1970). The Soviet Economy, Homewood, Illinois: Richard D. Irwin.

Boyd, M.S. and Brorsen , B.W. (1988). Price Asymmetry in the U.S. Pork Marketing Channel. North Central Journal of Agricultural Economics, (January): 103- 109.

Buttel, F.H. and Gillespie Jr., G.W. (1988). Agricultural Research and Development and the Appropriation of Progressive Symbols: Some Observations on the Politics of cological Agriculture. Bulletin No. 151, Ithaca: Cornell University, Department of Rural Sociology.

Brus, Wlodzimierz, and Laski, Kazimierz. (1989). From Marx to the Market: Socialism in Search of an Economic System,. Oxford: Clarendon Press.

Campbell, John Y. and Shiller, Robert J. (1987). Cointegration and tests of present-value models. Journal of Political Economy, vol. 95: 1062-88.

Chao, K. (1970). Agricultural Production in Communist China 1949-1965, Madison: University of Wisconsin Press.

Chavance, Bernard. (1994). The Transformation of Communist Systems: Economic Reform Since the 1950s University of Paris VII (Translated by Charles Hauss), Boulder: Westview Press.

China Daily (1990, December 4), p.1.

China, Ministry of Agriculture, Planning Bureau, (1989). Zhingguo Nongcun Jingji Tongji Ziliao Daquan, 1949-86, Beijing: Agriculture Press.

China, People's Republic of, Ministry of Agriculture, Research Center of Rural Development in China, (1991). Policy 1986 and Plan of Ministry of Agriculture, Beijing: China 1991.

China, People's Republic of Ministry of Water Resources and Electric Power. Compiled Statistics on the Development of China's Water 10 Resources and Electric Power, Press, 1988, 1989, and 1990.

Commander, Simon (Ed), (1989). Structural Adjustment and Agriculture: Theory and Practice in Africa and Latin America, London: Overseas Development Institute.

Corr, E.G., Ambassador, Director of Institute of Energy Americas at University of Oklahoma. (1995). Interview by author, December. & Written comments on author's dissertation proposal.

Crook, Frederick W. (1985). The Baogan Daohu Incentive System: Translation and Analysis of Model Contract. China Quarterly. 102 (June). 291-305

Csikos-Nagy, B. (1971). The New Hungarian Price System. In Friss, I. (Ed). Reform of the Economic Mechanism in Hungary. Budapest, Akademiai Kiado.

----------. (1979). Towards a New Price Revolution. Budapest, Akademiai Kiado.

Department for Economic and Social Information and Policy Analysis Statistical Division (1995). 1972-95. Monthly Bulletin of Statistics. New York: United Nations.

Dickey, D.A. (1976), Estimation and Testing of Nonstationary Time Series, Unpublished Ph.D. Thesis, Ames: Iowa State University.

Dickey, D.A. and Fuller W.A. (1979), Distribution of the Estimation for Autoregressive Time Series with a Unit Root, Journal of The American Statistical Association, 74, 427-431.

Dreze, J. (1983). Nonspecialist Teaching of Econometrics: A Personal Comment and Personalistic Lament. Econometric Review 2: 291-299. Quoted in Peter Kennedy. A Guide to Econometrics. 2d ed., 152. Cambridge, MA: The MIT Press, 1985.

Du, R. (1985). Second-Stage Rural Structural Reform. Beijing Review 24 June: 25.

Editorial Board of the Almanac of China's Economy. (1987). Almanac of China's Economy, Beijing: the Almanac of China's Economy Press.

Editorial Board of the Almanac of China's Foreign Economic Relations and Trade, (1987), Almanac of China's Foreign Economic Relations and Trade, Beijing: Zhongguo Zhanwang Press.

Editorial Board of China Agricultural Yearbook (989), Annual Volumes (1981 to 1988, Zhongguo Nongye Nianjin, Beijing: Agriculture Press.

Engle, R. and C. Granger (1987) Co-integration and Error Correlation: Representation, Estimation and Testing. Econometrica, 55, 251-76.

Fama, E.F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. Journal of Finance, v.25, 383-417.

Fan, S., Cramer, G.L. and Wailers, E.J. (1994). Food Demand in Rural China: Evidence from Rural Household Survey. Agr. Econ. 11(September): 61-9.

Fan, S., Wailes, E.J. and Cramer, G.L. (1995). Household Demand in Rural China: A Two-Stage LES-AIDS Model. Amer. J. Agr. Econ. Feb. 54-62.

Friedman. in China. (1990). Hong Kong: The Chinese University Press.

Garrett, James L. (1995). Price Liberalization and Price Transmission in Food and Agricultural Markets in Bolivia: A Politico-Economic Approach. Ph.D. Dissertation, Department of Economics, Cornell University.

Granger, C. W. J. (1985a), Testing for Causation in a Decision Science, Working Paper, Department of Economics, University of California, San Diego.

Granger, C.W.J. (1966), The Typical Spectral Shape of an Economic Variable. Econometrica 34. 150-161.

Granger, C.W.J. (1969b). Investgating Casual Relations by Econometric Models and Cross-spectral Models. Econometrica. 37: 424-438.

Granger, C.W.J. and Newbold, Paul. (1986). Forecasting Economic Time Series. 2nd ed. Orlando, Florida: Academic Press, Inc. 114-119.

Green, William H. (1990). Economic Analysis. New York: MacMillan Publishing Co.

Greenshields, B. L. and Bellamy, K .A. eds. Rural Development -- Growth and Equity. Aldershot, Hampshire: Gower Publishing,

Griffin, K. (1984). Institutional Reform and Economic Development in the Chinese Countryside. London: MacMillan Press.

Guo, Jiann-Jong. (1992). Price Reform in China, 1979-86. The MacMillan Press LTD, Great Britain

Halbrendt, Catherine. Tuan, Francis. Gempesaw, Conrado and Dolk-Etz, Dimphna. (1994). Rural Chinese Food Consumption: The Case of Guangdong. American Journal of Agricultural Economics 76 (November ): 794-799

Hartland-Thunberg, Panelope. (1989). A Decade of China's Economic Reform: Challengers for the Future. Washington, D.C.: The Center for Strategic and International Studies.

Hausman, J.A. (1978) Specification Tests in Econometrics. Econometrica, 46, 1251-79.

Heal, G.M. (1981). Scarcity, Efficiency and Disequilibrium in Resource Markets. The Scandinavian Journal of Economics, v.83, 334-51.

Hewett, (Ed), (1988). Reforming the Soviet Economy. Washington: Brookings Institution.

Hohnson, D. Gale. (1989). Economic vs. Noneconomic Factors in Chinese Rural Development, Paper No. 89:13, Office of Agricultural Economic Research, University of Chicago, Chicago, IL.

Hooper, Peter, and Mann, Catherine L. (1989). Exchange Rate Pass-through in the 1980s: The Case of U.S. Imports of Manufactures. Brookings Papers on Economic Activity 1: 297-337.

Hotelling, H. (1931). "The Economics of Exhaustible Resources," Journal of Political Economics, 39, 137-75.

Houck, James P. (1977). An Approach to Specifying and Estimating Nonreversible Functions. American Journal of Agricultural Economics. 59 (August): 570-572.

International Monetary Fund (IMF). Various issues. International Financial Statistics. Washington, D.C. IMF.

----------. (1993) World Economic Outlook, Washington, D.C.: IMF

----------. (1982) International Historical Statistics Africa and Asia, Washington, D.C. IMF

Johnston, Bruce F. and Mellor, John W. (1961). The Role of Agriculture in Economic Development. American Economic Review, September 1961, 566-93.

Johnson, D. Gale. (1989). Economic vs. Noneconomic Factors in Chinese Rural Development. Paper No. 89: 13. Office of Agricultural Economics Research, University of Chicago, Chicago, IL.

Judge, George G., W.E. Griffiths, R. Carter Hill, Helmut Lutkepohl and Tsoung Chao Lee. (1985). The Theory and Practice of Econometrics. 2d ed. New York: John Wiley and Sons: 867-870.

Kennedy, Peter. (1992). A Guide to Econometrics. 3d ed. Cambridge MA: Blackwell Press.

Kim, Icksoo, (1994), The Political Economy of Investment Control in Post-1978 China, in by Fan, Qimiao and Nolan, Peter. (Eds), China's Economic Reform: The Cost and Benefits of Incrementalism, Great Britain: The MacMillan Press Ltd.

Kondonassis, A.J. and Colleagues. (1991). Major Issues of Global Development. Continuing Education and Public Service in cooperation with the Department of Economics in both of the University of Oklahoma.

Kornaï, Janos. (1985) Comments on Paper Prepared in the World Bank About Socialist Countries, CPD Discussion Paper, no.10.

---------. (1990), Vision and Reality, Market and State. London: Harvest-Wheatsheaf.

---------. (1992), The Socialist System: The Political Economy of Communism. Princeton: Princeton University Press.

Kueh, Yak-Yeow, (1984), China's New Agricultural-Policy Program: Major Economic Consequences, 1979-83. Journal of Comparative Economics 8 (December), 353-75

----------. (1985), The Economics of the 'Second Land Reform' in China. China Quarterly 101 (March), 122-31.

Kuznets, Simon. (1965). Economic Growth and Structure. New York.

Lardy, Nicholas R. (1994). China in the World Economy, Washington D.C.: Institute for International Economics

Lewis, P. and Andrews, N. (1989). Household Demand in China. Appl. Econ. 21(June): 793-807.

Lin, J. (1992). Rural Reforms and Agricultural Growth in China. Amer. Econ. Rev. 82(March 1992): 34-51.

Lin, Justin Yifu. (1987). The Household Responsibility System Reform in China: A peasant's Institutional Choice. American Journal of Agricultural Economics 69 (May), pp. 410-15

Lin, Justin Yifu., Burcroff, II Richard., Feder, Gershon. (1993). Agricultural Reform in a Socialist Economy: The Experience of China. World Bank. Washington, D.C.

Liu, Minquan, (1994), Commune, Responsibility System and China's Agriculture, in Fan Qimiao and Peter Nolan (Eds). China's Economic Reforms: The Costs and Benefits of Incrementalism, Great Britain: MacMillan Press Ltd.

Luo, Han Xian. (1985). Economic Changes in Rural China. Beijing: New World Press.

Lu, Nan. (1983). Shengchan Yu Shangqu Jiage (The Production Price and Two-tier Price). Lunwen Xuanji, Beijing: China Price Society.

Mann, Catherine. (1986). Prices, Profit Margins, and Exchange Rates. Federal Reserve Bulletin 72 (June): 366-379.

McLenaghan, John B., Director, IMF Statistics Department. (1994). International Financial Statistics Yearbook. Washington, D.C.

McMillan, John, John Whalley, and Li Jing Zhu, (1989), "The Impact of China's Economic Reforms on Agricultural Productivity Growth." Journal of Political Economy 97(4), 781-807.

Michael P. Todaro, (1994), Economic Development (Fifth Edition), Longman, 10 Bank Street, White Plains, N.Y. 10606.

Milenkoritch, O.D. (1971). Plan and Market in Yugoslav Economic Thought. New Haven: Yale University Press.

Mitchell, B.R. (1982). International Historical Statistics Africa and Asia. New York: New York University Press.

Myers, Ramon H. (1986). The Economic Development of the Republic of China on Taiwan, 1965-81. Lawrence J. Lau (Ed). Models of Development: A omparative.

Nove, Alec. (1986). The Soviet Economic System. 3rd ed. London: Allen and Unwin.

Paul, Kegan. (1986). In Kaser, M. (Ed), The Economic History of Eastern Europe. Vol.3. Oxford: Clarendo Press.

People's Daily Overseas Edition (1996a), Jan. 20.

People Daily Overseas Edition (1996b). Jan. 14.

People's Daily, Overseas Edition (1996c). September 24.

Perkins, (1991) Perkins News Week, op.cit.,table 6.

Perkins, D., and Yusuf, S. (1984). Rural Development in China. Baltimore MD: Johns Hopkins University Press.

Pindyck, Robert S. (1993). The Present Value Model of Rational Commodity Pricing. The Economic Journal, 103 (May), 511-530. Blackwell Publishers, Cambridge, MA, USA.

Porters, R. (1989). The Economy Theory of Measurement of Macroeconomic Disequilibrium in Centrally Planned Economics. In Davis, C. and Wojciech, C. (Eds), Models of Disequilibrium and shortage in Centrally Planned Economies. New York: Chapman and Hall.

Prosterman, Roy; Hanstad, Tim and Li, Ping, (1995), With Reforms, Masses can be Fed. The Wall Street Journal, April 7 1995, PA11(W), PA15(E), col. 2.

Prout, C. (1985). Market Socialism in Yugoslavia. Oxford, Oxford University Press.

Pysz, Piotr. (1987). The Polish Economic Reform: Central Planning or Socialist Markets? In Gey, Peter, Kosta, Jiri, and Quaisser Wolfgang (Eds), Crisis and Reform in Socialist Economies. Boulder: Westview Press.

Riskin, Carl. (1987). China's Political Economy. New York: Oxford University Press.

Roe, Terry, Matthew Shane, and De Huu Vo. (1986). Price Responsiveness of World Grain Markets. Washington, D.C.: U.S. Department of Agriculture. USDA Economic Research Service Technical Bulletin No. 1720.

Samuelson, P.A. (1965). Proof that Properly Anticipated Prices Fluctuate Randomly. Industrial Management Review, v.6, 841-62.

Shultz, Theodore. (1964). Transforming Traditional Agriculture. New Haven: Yale University Press

Sicular, Terry. (1988). Agricultural Planning and Pricing in the Post-Mao Period. China Quarterly, 116(December), 671-705.

Stamp, J. (1929). Some Economic Factors in Modern Life. London: King and Son.

State Statistical Bureau (SSB). (1993). Chinese Statistical Abstract. Beijing: China Statistics Press.

State Statistical Bureau (SSB).(1978). Statistical Yearbook of China (SYC). Beijing: China Statistics Press.

State Statistical Bureau (SSB). (1988). Statistical Yearbook of China (SYC). Beijing: China Statistics Press.

State Statistical Bureau (SSB). (1994). Statistical Yearbook of China (SYC). Beijing: China Statistics Press.

Stone, B. (1988). Relative Prices in the People's Republic of China: Rural Taxation Through Public Monopsony, in Mellor, John R. and Ahmed, R. (Eds), Agricultural Price Policy for Developing Countries. Baltimore, Johns Hopkins University Press.

Study of Economic Growth in South Korea and Taiwan. San Francisco: Institute for Contemporary Studies Press, pp. 13-64.

Susumu, Yabuki, (1993), China's New Political Economy, The Giant Awakes, Harner, Stephen M. (Translated), Boulder: Westview Press,.

Swaminathan, K.V. (1991). Technology Transfer Through Foreign Investment. In Technology Transfer and Development in a Changing International Environment: Policy Challenges and Options or Cooperation (UNCTADITPTEC21), United Nations Publication, Sales No.E91.II.D.19, p.29.

The Almanac of China's Economy Editorial Board. (Ed), (1987). The Almanac of China's Economy. Beijing: The Almanac of China's Economy Press.

----------. (1994). The Almanac of China's Economy. Beijing: The Almanac of China's Economy Press.

The Daily Oklahoman, (1996), (1996, Sept. 5).

Thornton, Judith. (1976). Economic Analysis of the Soviet-Type System. New York: Cambridge University Press.

United Nations. (1995). Monthly Bulletin of Statistics, Jan. p201. Lake Sucess, NY: The Office.

----------. Monthly Bulletin of Statistics 1972-95, Lake Sucess, NY: The Office.

Van der Gaag, J. (1984). Private Household Consumption in China: A Study of People's Livelihood. Washington DC: World Bank Staff Working Paper No. 701, 1984.

Wang, Hui. (1994). The Gradual Revolution--China's Economic Reform Movement. New Brunswick: Transaction Publishers.

Wilczynski, J. (1972). Socialist Economic Development and Reforms. London: MacMillan.

Wolffram, Rudolph. (1971). Positivistic measures of Aggregate Supply Elasticities: Some New Approaches -- Some Critical Notes. American Journal of Agricultural Economics. 53 (May): 356-359.

Wong, John, Rong Ma and Mu Yang, (Eds), (1995), China's Rural Entrepreneurs: Ten Case Studies, Singapore: Times Academic Press for the Institute of East Asian Political Economy.

Woo, Henry K.H. (1991). Effective Reform in China: An Agenda. Preager Publishers, One Madison Avenue, New York, NY 10010.

World Bank. (1993). Global Economic Prospects and the Developing Countries. Washington, D.C.

World Bank. (1993). International Trade and Commodity Markets. Washington, D.C.

World Bank. (1993). The Agricultural Transition in Central and Eastern Europe and the Former USSR. Washington, D.C.

World Bank. (1993). Trade and Development Report. Washington, D.C.

Yi Et Al, Xu. (1982). Socialist Pricing Theory. Beijing, China's Financial and Economic Publications.