OECD DEVELOPMENT CENTRE

Working Paper No. 18
(Formerly Technical Paper No. 18)

ECONOMIC POLICIES AND SECTORAL GROWTH: ARGENTINA 1913-1984

by

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Research programme on:
Changing Comparative Advantage in Food and Agriculture

June 1990

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RÉSUMÉ

Cette étude porte sur les variations de la croissance en Argentine de 1913 à 1984. Son analyse détaillée de l'économie repose sur l'identification de trois secteurs productifs distincts : l'agriculture, les activités non-agricoles et le domaine étatique. Cette division permet d'examiner leurs performances relatives dans le contexte des politiques macro-économiques.

L'étude met l'accent sur le rôle des taux de change réels, non seulement au regard de la fiscalité et des échanges, comme on le fait souvent, mais également des politiques macro-économiques. L'effet différentiel des variations des taux de change sur ces secteurs est analysé sous l'angle de leurs conséquences sur les échanges. L'ouvrage étudie ensuite l'influence des politiques macro-économiques et commerciales sur les prix sectoriels, ainsi que sur les termes des échanges internationaux ; il étudie par ailleurs leurs effets sur la production de chaque secteur, la répartition des ressources et la productivité.

La simulation de la croissance argentine de 1913 à 1984 est réalisée à l'aide d'un unique modèle dynamique.

SUMMARY

In analysing Argentina's variable growth record over the period 1913 to 1984, the study develops a comprehensive framework which disaggregates the economy into three sectors: agriculture, nonagriculture and government. The aim is to examine the relative performance of these sectors in the context of macro-economic policies.

The study focuses on the role of the real exchange rate. This is related not only to taxation and trade, as is often the case, but also to macro-economic policies. The differential impact of changes in the real exchange rate on the different sectors is examined, according to their degree of tradability. This analysis is then developed to show how sectoral prices are affected by macro and trade policies, as well as world terms of trade and how this affects sectoral output and hence, resource allocation and productivity.

The analysis is presented in terms of a single dynamic model which simulates the growth of the Argentine economy over the entire 1913-1984 period.

PREFACE

The Development Centre's 1987-89 programme on "Changing Comparative Advantage in Food and Agriculture" brought together analysis of the policies influencing international interactions with those affecting agricultural development on the national level. This study focuses on the macro-economic determinants of agricultural growth in Argentina.

The study offers an important contribution both in terms of the original way in which agriculture is viewed in relation to the other economic sectors and in terms of the application of a consistent and comprehensive framework for analysis.

The broad historical view presented in the study yields insights into the factors accounting for Argentina's recent dismal performance, and highlights the extent to which macro-economic policies account for its changing fortunes. The underlying hypothesis of the study is that the structure of trade has shaped the balance of sectoral activities and that this in turn has been strongly influenced by macro-economic policies, which determine the real exchange rate and which in turn influence the extent to which different economic sectors are allowed to develop.

The current study is an extension and development of the author's earlier work. These developments include the clear exposition of the interaction of macro-economic policies with agricultural development. Different policies, the study convincingly shows, would have benefited not only agriculture, but also led to a significant improvement in Argentina's overall economic performance.

In terms of its important analytical and methodological innovations, the study will appeal to academics. Its persuasive and coherent policy conclusions should make it essential reading, however, for a much wider audience.

Louis Emmerij
President of the Development Centre
May 1990

CHAPTER 1

SUMMARY

Argentina is well endowed in land and good climate for agricultural production. Consequently, agriculture has played a very important role in the Argentinean economy and it is still the main export sector. Like in many other developing countries, agriculture has been heavily taxed, both directly, through export tax, and indirectly, through protection of the non agricultural sector and through macro policies which caused domestic prices of non agricultural products to increase relative to agricultural prices. These policies had a negative effects on the rate of growth of agricultural output as well as of overall output of the economy.

The ideology for some of these policies were based on two premises. First, it was inspired by a pessimistic attitude toward the ability of the market to solve the problems faced by Argentina. It was claimed that the foreign terms of trade badly affected exporting countries. This statement is empirically correct, but the conclusion is wrong. The reason for the deterioration of the agricultural terms of trade in world markets is that technical change in agriculture has generated an excess supply, in spite of the continuous growth of demand caused by growing population and income. On the whole, the increase in productivity due to the technical change more than offset the decline in profitability caused by the deterioration in the terms of trade. This is basically the reason that supply - worldwide - has increased in spite of the real price decline.

The second premise is that agricultural output does not respond to price. The empirical base for this premise is derived from inappropriate methodology. The present study provides an alternative methodology, which structures the dynamic of supply response and shows that agriculture does respond to price.

This report evaluates the effects of trade and macro policies on agriculture and the rest of the economy. The remainder of this section introduces the analysis and provides the framework for its evaluation. Economic growth is the process through which societies increase their average per capita consumption. Data indicate that growth rates are not the same across countries nor are they the same over time in a given country. The explanation of such variations has been one of the most pressing subject in economics. As a matter of definition, growth is achieved by an increase of (per capita) resources, or simply capital and by an improvement in the efficiency of their utilization. In an open economy the increase in capital stock depends on its profitability relative to the rest of the world. The efficiency of resource use is achieved by fully utilizing resources with existing technology and by the improvement of technology. The change of technology is strongly related to capital accumulation.

Theories and views of growth have to be confronted with the data in order to gain perspective of their relevance for explaining the historical record. The present study is an effort in this direction. It analyzes the experience of Argentina over the period of 1913-1984. This is a very interesting case in view of Argentina's variable growth record. Between 1900 and 1930, Argentina had an average annual per capita rate of growth of 1.8 per cent, considerably higher than that of the United States (1.3), Australia (0.8), Brazil (1.2), and Canada (1.2). From that period on, Argentina has started to lag behind in its growth performance, and the gap in income between Argentina and other countries of the new world with similar resource base has constantly increased. This phenomenon has lasted too long to be ignored by simply assuming it to be a response to exogenous stochastic shocks. The reason has to be searched in the domain of policies that were pursued in the face of such shocks and without them. Such a search requires a comprehensive and consistent framework. The

work by Mundlak, Cavallo and Domenech, (MCD, 1989), on which this manuscript is based, is an effort in this direction. The framework is that of sectoral growth, where the economy is disaggregated into three sectors: agriculture, nonagriculture and government. The underlying approach here is that growth, or lack of it, comes as a response to the economic environment, subject to the institutional constraints. In as much as changes in institution are pertinent, they manifest themselves through economic variables, and it is largely the latter that affects agents decisions.

Much of the relevant economic environment is related to the important role that trade plays in Argentine economy, with agriculture being the exporting sector and nonagriculture the importing sector. Real prices faced by producers depend on world prices, the rate of exchange, the taxes on trade, restrictions on trade, or inversely, the openness of the economy, as well as the price level of the domestically produced product. In the literature, such dependency is dealt under the subject of real exchange rate, which expresses the amount of domestic resources needed to produce one unit of an aggregate tradable good.

The present work is based on two extensions related to the real exchange rate. First, we relate changes in the real exchange rate not only to taxation on trade as is often the case, but also to macro policies, or simply to the actions of the government and the central bank. Second, the real exchange rate affects the different sectors differentially according to their degree of tradability. This concept is developed and measured here. These two extensions are integrated in the analysis to show how sectoral prices are affected by macro and trade policies, as well as by world terms of trade.

The variations in sectoral prices affect sectoral outputs in two ways. First, through intersectoral resource allocations. The empirical formulation of this process is dynamic and allows for variations in sectoral growth rates of resources. Second, the productivity of resources is also affected by sectoral prices, both through the level as well as through the stability of prices. This approach recognizes that the scope of producers' decisions is not limited to properly locating themselves on a given production function but it is much broader in scope, in that it requires also a decision of what production functions or techniques they should employ.

Thus, a framework is developed to allow the economic environment to affect directly resource allocation and productivity. Combined together with the determinants of sectoral prices, we obtain a structure for evaluating the consequences of policies. This is a dynamic structure which can be estimated empirically and solved to simulate the economy. Specifically, a single model is developed which simulates the path of the Argentine economy over that whole period of 1913-1984. This is an extension and expansion of an earlier study (Cavallo and Mundlak, 1982).

The present report summarizes some of the findings of MCD, (1989). The next chapter discusses the background. This is followed by a discussion of the price and production blocks and a summary of the remaining parts of the model. The model is used to simulate the economy. This facilitates to show that the model fits the data well and as such it provides a paradigm of the economic development in Argentina. The model is used to examine in some detail three important subperiods of Argentina's economic history which brings out very clearly the importance of policies in affecting the growth path of the economy. The main conclusions are reported at the end. The most interesting outcome of this exercise is that it is shown that if Argentina relied more on trade and restricted its macro policies to stabilization of short term macro fluctuations it could have had the same growth trajectory as Australia, which means that its income level in 1984 would have been 63 per cent higher.

CHAPTER 2

BACKGROUND

Until the Great Depression of the 1930s, agriculture was the staple sector of the Argentine economy. Between 1860 and 1930, the exploitation of the rich land of the Pampas strongly pushed economic growth. During this period, Argentina grew more rapidly than the United States, Canada, Australia and Brazil, countries similarly endowed with rich land and which also hosted large inflows of capital and European immigrants. Table 2.1 shows that during the first three decades of this century, Argentina outgrew the other four countries in population, total income and per capita income.

However, beginning in the 1930s, Argentine economic vitality deteriorated notably as is also shown in Table 2.1. This loss of vitality was especially dramatic in agriculture. An impressionistic picture of this phenomenon is provided by a comparison of crop yields in Argentina and in the United States which are plotted in Figure 2.1. In the late 1920s, crop yields were similar, but after that year, yields in Argentina were always below the US levels. Comparing the average yield for the periods 1913-30 and 1975-84, agriculture in the United States tripled its yields. In Argentina they did not even double.

The Approach

Economic growth generates significant changes in the sectoral composition of an economy. In the early stages of growth, an economy is largely rural, while in mature economies, agriculture constitutes only a small portion of the economy. Since a large portion of the world's population still lives in rural areas, it is very important to understand the dynamics of this process. The subject of sectoral growth can be placed in a broader perspective, since the process of growth in mature economies generates other sectoral changes of great importance, such as a shift toward services. This process has many similarities to the process of industrialization.

Growth is generated by an accumulation of physical and human capital, and technical change. Technical change itself depends on the pace of capital accumulation. This is true, both for the rate of technical change and for its factor bias. The simple fact that the capital-labor ratio increases generates incentives for innovations designed to produce labor saving techniques (Mundlak, 1988). Thus, even though the process of sectoral growth calls for a movement of resources across sectors, it is applied differently to labor and capital.

Overall growth increases the possibilities for consumption. The utility functions of consumers are not homothetic, therefore, the income elasticity for food is less than one and, in general, is considerably smaller than one. Also, the price elasticity of demand for food is low. Thus, an equiproportionate increase in output must cause an excess supply in the income inelastic sector. As a consequence, its relative price declines, and the lower the price elasticity, the larger the decrease in price caused by a given amount of excess supply. As a result, the value of output distributed to factors of production in agriculture declines, and their rates of return decline relative to those obtained in nonagriculture, and resources move from agriculture to nonagriculture.

This is a simplified statement of the process and, as such, it abstracts from many pertinent details which do not change the overall picture. The above description applies to a closed economy. Therefore, on the face of it, the behavior of open economies, such as the economy of Argentina, should be different. This qualification is

true. However, the world is a closed economy, and since the process is common to all countries, global excess supply is generated by the aforementioned process that causes world agricultural prices to decline, thereby affecting exporting countries. In a recent study, it was reported that the trend components of prices of the main agricultural products, deflated by US wholesale prices, declined over the period 1900-84 at a rate of at least 0.5 per cent per year (Binswanger *et al.*, 1985). Thus, the called-for adjustment in factor allocation does not skip over exporting countries.

The decline in the relative weight of agriculture in total output calls for intersectoral resource allocation. Such allocation is costly and therefore, it is not instantenous. As a result, there are wide intersectoral gaps in wage rates. Thus, it cannot be assumed that resource allocation at any given time is in equilibrium in the comparative static sense. This has repercussions for almost any empirical question and specifically for the evaluation of the determinants of resource allocation and their time path. The implication of this in studying the sectoral growth path of the economy is demonstrated in the study of the growth of the Argentine economy over the period 1947-72 (Cavallo and Mundlak, 1982). The particular formulation used for sectoral growth made it possible to evaluate the consequences of significant economic policies implemented in Argentina, which consisted of taxing agriculture, either directly through export taxes or indirectly through the protection of nonagriculture, maintaining a large and highly inefficient public sector, and not independently, a highly overvalued peso. Our study has shown that these policies caused agricultural growth to lag behind that observed in other countries producing grain and livestock, such as the United States. Our previous study also suggested that policies that harmed the performance of agriculture, especially those reflected in currency overvaluation, also had a negative effect on overall growth. The present research looks at both issues in more detail and for a longer period of time. The effect of economic policies on sectoral composition and overall growth is studied for the period 1913-1984. Special emphasis is placed on examining the important role of the real rate of exchange. The remainder of this introductory chapter gives a summary description of some sectoral attributes which are pertinent for the understanding of the rest of the report.

Characteristics of Economic Policies

Economic policies are classified here into three main groups: macroeconomic, income and trade policies.

Macroeconomic policy includes government decisions concerning the size of government expenditures relative to total income, the way in which they are financed, and the rate of growth of the money supply. Three relevant macro policy indicators were constructed for the period analyzed. The first is the share of government consumption in total income. This provides a measurement of the size of government expenditures. As can be seen in Figure 2.2, government expenditures show a clear upward long-term trend. After the mid-1940s, several significant ups and downs can be observed. This suggests that government expenditures drastically increased but reached levels that could not be sustained later. Therefore, the high levels were partially reversed after a few years.

Another indicator of macro policies is the fiscal deficit. Figure 2.3 plots the fiscal deficit as a proportion of national income and its decomposition into the part financed by monetary creation and the part financed by borrowing. After 1930, the fiscal deficit was much larger than the levels it had reached previously, exceeding 10 per cent of total income during some subperiods. The sources of fiscal deficit financing changed frequently during the analyzed period. Figure 2.4 shows the rate of growth of the money supply over and above the rate of growth of output valued at foreign prices or, in other

words, the rate of devaluation adjusted for real growth and foreign inflation. The plot shows that monetary policy was very unstable after 1930. Some years showed large expansions that were followed by large contractions.

Income policy includes management of some crucial prices and wages. It is usually used to cope with income distribution goals. In the Argentine economy, the two prices most commonly managed, at least in the short run, were the official price of foreign exchange and wages.

A good indicator of income policy is the government wage corrected by average labor productivity. Every time it moves upwards, the government is attempting to redistribute income in favor of labor. This attempt is usually accompanied by an expansionary monetary policy.

Trade policy includes taxes on exports and tariffs on imports, as well as quantitative restrictions on both sides of foreign trade. Taxes on exports and tariffs on imports are plotted in Figure 2.5. The shadowed area indicates the wedge between domestic and foreign prices caused by taxation on foreign trade. Note that this wedge increased significantly after the Great Depression. In addition to taxes on imports and exports, there were periods when the exchange rate was not the same for imports and exports. This implies an implicit tax in addition to the direct tax on the two traded commodities. These two types of taxation were not determined independently. In practice, whenever the official exchange rate for imports is set at a lower level than the exchange rate for exports, there is an implicit subsidy for imports that has a counterbalancing effect to that of taxes. This was particularly relevant during 1975-76, when the rate for imports was considerably lower than the rate for exports.

The reduction in the wedge that Figure 2.5 shows for later decades does not necessarily mean that trade distortions were reduced. This is because taxes on exports and tariffs on imports were estimated by dividing actual tax revenues by the value of exports and imports, respectively, and therefore, they do not capture the effect of quantitative restrictions. While on the export side taxes have been the most important restrictions on trade, in the case of imports, quantitative restrictions became dominant after the 1940s. Although there is no direct measurement of quantitative restrictions, they usually became more stringent whenever the black market exchange rate departed from the official rate. The black market premium is presented in Figure 2.6.

Characteristics of the Economic Sectors

The analysis is carried out by distinguishing three sectors in the economy: agriculture (sector 1), nonagriculture excluding government (sector 2), and government (sector 3).

Agriculture is the sector that produces the bulk of exportable goods. Nonagriculture excluding government is the sector that produces import substitutes. Economic policies have different effects on agriculture and nonagriculture due to two basic sectoral characteristics:

a) Agriculture is more capital intensive than nonagriculture: The shares of capital in sectoral income are plotted in Figure 2.7 for each sector. As summarized in Table 2.2, the share of capital averaged 60 per cent in agriculture and 40 per cent in nonagriculture. Note, however, that in the latter decades the difference became much smaller.

b) Agriculture is more internationally tradable than nonagriculture: This can be seen in Figure 2.8 where implicit shares of tradables in sectoral output are plotted. As

summarized in Table 2.3, while agriculture has an average tradable component of 68 per cent of sectoral output, nonagriculture averages only 47 per cent.

CHAPTER 3

PRICES

This chapter describes the structure of the price block designed to explain the a) prices of agriculture and nonagriculture, relative to that of government services, b) the real rate of exchange, and c) the degree of openness of the economy. The system is used to simulate the effect of policy changes that would make the economy more competitive in world markets and more stable. The discussion begins with an outline of the conceptual framework, it is followed with the empirical analysis and concludes with the policy issues.

Introduction

In an open economy, the prices of the tradable products are determined by their world prices, nominal exchange rates and taxes. However, some products are not tradable and therefore their prices are determined domestically by domestic supply and demand. As the behavior of agents depends on relative prices, some important decisions depend on the ratio of the price of tradables to that of non tradables or, simply, the real exchange rate. Clearly, the real exchange rate is determined domestically within a framework which has the important features of a closed economy. As such, it depends on local determinants of supply and demand including actions by the public sector.

The discussion of the real exchange rate is generally conducted at a high level of aggregation for an economy which is dichotomized to a tradable and a nontradable sectors. Such a dichotomy simplifies the discussion and helps to focus on some important issues but its empirical relevance is limited. There are no sectors of the economy which can be classified as purely tradables or nontradables. To illustrate, a television set is a tradable product, but the price of a television set quoted in a department store at the Ginza district of Tokyo reflects inputs, such as location, which are nontradable. Thus, if the purpose of the analysis is to help us to understand price differentials over time, or across sectors or countries, more structure has to be added to the analysis. This calls for a measure of the degree of tradability.

The degree of tradability measures the share of the tradable component in the price of a product. Hence, policies or shocks that affect the prices of tradables affect product prices according to their degree of tradability. Similarly, policies or shocks which affect the prices of domestic resource affect the product prices according to their degree of nontradability. This conceptual framework is useful in evaluating the response of sectoral prices to policies which are not sector specific. This concept is applied empirically. It is done by first analyzing the determinants of the real exchange rate and then relate the real exchange rate to sectoral prices. The analysis of the real exchange rate includes the effects of macro variables which are often ignored. The structural relationships depend on the degree of openness of the economy. This variable is determined jointly with the other variables in the system.

Real Rate of Exchange

Commercial Policy

Much of the empirical work on the effects of tariff on the real exchange rate has followed the framework in Dornbusch, (1974). This framework serves as a point of departure for the present analysis. The economy is divided into three sectors:

exportables (x), importables (m), and home goods (h). It is assumed that Argentina can be treated as a small open economy in the sense that it is a price taker in world markets. In this case, the prices of the two traded goods are determined by:

$$P_j = P_j^* E\, T_j, \quad j = x,m \tag{1}$$

where P_j^* is the world price, E is the nominal exchange rate, and $T_j = (1 + t_j)$, t_j is the tax rate. While the domestic supply and demand of the two traded goods need not be equal because the gap is closed by trade, the same is not true for the home good. By the very fact that it is nontradable, domestic supply and demand must be equal and this is achieved through the adjustment of Ph. This leads to the following implicit function:

$$\Phi(p_x, p_m) = 0 \tag{2}$$

where $p_j = P_j / P_h$ is the price of the jth tradable product in terms of the home good. Under weak conditions (2) can be differentiated logarithmically to yield:

$$\hat{p}_x = \omega(\hat{p}_x - \hat{p}_m) \tag{3}$$

where $\hat{p}_j = D\ln p_j$, $\omega = \Delta_m / (\Delta_m + \Delta_x)$, Δ_j is the elasticity of excess supply of the home good with respect to the price of the j-th tradable good. Equation (3) can be rewritten as:

$$\hat{P}_h = (1 - \omega)\hat{P}_x + \omega\hat{P}_m \tag{4}$$

which indicates that in this framework the price of the home good changes only as a result of changes in the domestic prices of the tradables, and the larger is ω, the closer is the comovement of P_h and P_m. Integrating (4),

$$\ln p_x = a + \omega \ln(P_x / P_m), \tag{5}$$

and by rearranging:

$$\ln p_m = a - (1-\omega)\ln(P_x / P_m), \tag{6}$$

In view of (1), (5) and (6) provide a framework for evaluating the consequences of taxes on trade. Decompose the price of tradables according to (1)

$P_x/P_m = (P_x^*/P_m^*)\, T$, and $T = T_x/T_m$ to obtain:

$$\ln p_x = a + \omega \ln(P_x^*/P_m^*) + \omega \ln T \tag{5'}$$
$$\ln p_m = a - (1-\omega)\ln(P_x^*/P_m^*) - (1-\omega)\ln T. \tag{6'}$$

Equation (5') expresses the determination of the price of exportables in terms of the home good. It is positively related to the terms of trade and negatively related to the two taxes. The converse is true for the price of importables in terms of the home good as shown in (6').

Both p_x and p_m constitute measures of real exchange rate, but they behave differently in response to the exogenous variables, foreign terms of trade or taxes. The

more conventional measure of the real exchange rate is a weighted average of the two measures:

$$e = P^* T^* E / P_h \qquad (7)$$

where P^* and T^* are geometric averages of the foreign prices and the taxes (T_x and T_m) respectively. Let

$$P^* T^* = (P^*_x T^*_x)^b (P^*_m T_m)^{1-b} \qquad (8)$$

combining and rearranging we get:

$$\ln e = a - (1 - b - \omega) \ln (P^*_x / P^*_m) + (1 - b - \omega) \ln (T_m / T_x) \qquad (9)$$

When b = 1, the foreign price is measured by the export price, e varies positively with the foreign terms of trade. The opposite is true for the case where b = 0. In this case, the foreign price is measured by the import price and the results are identical to that of equation (6').

Previous Estimations of the Real Exchange Rate Equation for Argentina

Earlier estimates of the real exchange rate equation for Argentina were obtained by Rodriguez and Sjaastad, (1979), Cavallo and Garcia, (1985) and Mundlak, Cavallo and Domenech, (1987). These studies used basically the specification in (5)[1]. They differ somewhat in the variables used and the periods of analysis. On the whole the estimated values for ω were relatively low.

To see the implications of low values for ω, equation (9) is used to calculate the real exchange rate that would have existed in the absence of trade distortions by setting $T_x = T_m = 1$. When this is done using the various estimates of ω obtained in the above studies, it was found that the free exchange rate was lower rather than higher than its actual level. Since $\ln T_x$ is negative, this result is a consequence of the low value of ω. Referring to (4), this implies that in Argentina the price of the home good moved more closely with P_x rather than with P_m. Therefore, changes in t_x have a dominant influence on P_h when compared with changes in t_m. This was shown in Cavallo and Mundlak, (1982), where a model of the Argentina economy was used to simulate the effect of trade liberalization.

In the present model there is only one way to eliminate overvaluation of the real exchange rate and this is by changing taxes on trade. This follows directly from the specification which helps to focus on the role of taxes but abstracts from other considerations which are important in interpreting the data. These are taken up in the next section.

Extensions

There is an increasing awareness that the real exchange rate is not determined solely by the commercial policy[2]. Clearly, any variables that affect domestic prices affect the real exchange rate. This requires a modification of the empirical analysis. A start in this direction appears in Cavallo and Mundlak, (1982) and it is extended here. We now turn to review briefly the variables used in this analysis.

Degree of openness - Restrictions on trade modify the position of the economy and therefore the solution for the real exchange rate. A common restriction is to limit import. This tends to lower e. Incorporating trade restriction in the empirical analysis calls for a measure of a degree of openness of the economy. This measure is discussed below.

Capital inflow - Capital inflow increases the supply of tradables in the economy, as well as the level of expenditures. As all goods are normal, the relative price of tradables, *i.e.* the real exchange rate, should decline.

Composition of expenditures - In the foregoing discussion it was implicitly assumed that demand consists only of private consumption. The analysis can be generalized to cover also investment. This will cause a change in the demand parameters and it is in this sense that demand depends on the composition of the expenditures. The effect of expenditure composition is more important when the analysis is extended to include government.

Macro Policies - The demand composition of government, and its budget constraint, are different from those of the private sector. It has in general a larger component of the home good. It is therefore necessary to take an explicit account of this in the analysis. The effect of government on the real exchange rate is stronger when the government runs a deficit. The deficit is financed either by borrowing or by money creation. When the government borrows and the economy is financially open, this results in a capital inflow, and this leads to a decline in e. When the economy is financially closed, the borrowing will have a crowding out effect. The rate of interest will increase, and this will cause reduction in the expenditure of the private sector necessary to facilitate the expansion of the government expenditure. Such a change of expenditure composition causes a decline in e.

When the deficit is financed by an expansion of the money supply and the economy is financially closed, the expenditure of the private sector is reduced by the inflationary tax. Again, due to the change in composition of expenditure in favor of government, e declines. If the economy is financially open, and the nominal exchange rate is fixed, the monetary expansion will cause an increase in demand of the private sector. As the two goods are normal, the increase in demand will increase the capital inflow, and this causes e to decline. At the same time, there is an increase in demand for the home good by both sectors, and this reinforces the previous effect. The mechanism will change when E is flexible, but nevertheless e declines.

Long term effects - Much of the discussion on real exchange rate is related to short term variations, whereas empirical analyses are based on data which also reflect changes that can be classified as long term changes. A change in resources may affect the supply of the various goods differentially. The home good is thought to be labor intensive. In this case, capital accumulation reduces the price of the capital intensive sectors, which imply a decrease in e. Changes in technology may take different forms, which we shall not detail here. The net effect of such changes can be determined empirically. The income effect, which was neglected so far, can have an important influence on e, when the income elasticity for the home good is not unitary. If the demand for the home good is income elastic, then, as income increases other things being equal, the relative demand for it will increase and therefore e will decline. The converse is true when the demand for the home good is income inelastic.

Introducing the macro variables

Previous estimates of equation (5') with macro policy variables added indicate that macroeconomic policy has had an important effect on the real rate of exchange[3]. The resulting values for ω varied largely, depending on the degree of openness[4]. The main conclusion derived from these studies is that overvaluation of the Argentinean currency arose not just from commercial policy but also from macro and incomes policies. Moreover, these effects were shown to depend on the structural features of the economy. That has lead us to a more detailed specification, as given by the following equation:

$$\hat{p}_x = \omega (\hat{P}_x - \hat{P}_m) - \varepsilon_g \hat{g} - \varepsilon_d f - \varepsilon_m \hat{\mu} + \varepsilon_y \hat{Y}. \quad (10)$$

where the share of government consumption in total income (g) measures the composition of total expenditure. Borrowing (f) is measured by the share in total income of fiscal deficit financed by borrowing. Money supply - exchange rate management (μ) is measured as a proportion of money in nominal income evaluated in terms of foreign prices, $\mu = M/P^*EY$. Variations in the velocity of money are ignored. Total income (Y) is introduced to summarize the long term effects.

The coefficients in (10) are allowed to be linear functions of the degree of commercial (DOc) and financial (DOf) openness. The DOc is measured as a ratio of value of trade to total income. The DOf is measured as the ratio of the official exchange rate (E) to that of the black market rate (Eb), E/Eb.

By assumption, ω and the elasticities of real income and government consumption depend only on the DOc, while those of the fiscal deficit financed by borrowing and money supply are assumed to depend on both measures of openness. It is noted that by regressing the equation on the domestic terms of trade (p_x/p_m), rather than separately on the foreign terms of trade and the taxes, ω is restricted to take on a unique value. A summary of the results appears in Table 3.1.

The values of ω computed from the regression are plotted in Figure 3.1. They range between 0.75 and 0.07. The value was around 0.7 before 1930, when the economy was very open to the rest of the world. In that period, the price of the home good was more closely related to the price of imported goods than to the price of exports. This reflected a high degree of substitution in production and demand between the domestic and the imported good. As the economy became more closed to foreign trade due to the restrictions imposed on imports, ω went down. The lowest values are observed in the early 1950s when the economy was very closed. Recall that lower values of ω mean that the prices of home goods are more closely related to the domestic price of exports rather than prices of imports. Since the late 1950s, ω has oscillated around 0.25. This low value of ω explains why changes in export taxes produce only a small change in the effective real exchange rate for **exports**. When t_x goes down, the real rate of exchange is reduced and compensates for about 75 per cent of the change in t_x. In other words, a 20 per cent reduction of export tax produces only a 5 per cent increase in the price of the exported good relative to the price of the home good.

The intuitive explanation is as follows. When the tax on export, t_x, is reduced, the increased incentive to produce exportable goods induces an increase in exports and thereby an increase in income. As all goods are assumed to have positive income elasticities, their demand increases accordingly. That by itself generates an excess demand for the home good and forces its price to increase. Restrictions on imports cause some of the augmented demand for imports to be diverted to the home good and thereby generates a further increase of the price of the home good. There is also a price effect on the demand for exportables that further increases the demand of the home good. As a consequence, domestic prices increase and the real exchange rate decreases to absorb much of the initial increase in export prices. It is in this sense that domestic prices move in line with export prices. Of course, the outcome would be different if imports were allowed to increase unrestrictedly, *i.e.* if the economy were open. The estimated equation shows that opening the economy would result in an increase in the value of ω and therefore, a given change in t_x would have had a stronger effect on the relative price of exportables vis-à-vis the home good.

Government expenditures exercised a negative effect on the real rate of exchange. However, this effect is only significant after the 1930s, when the economy

became less open to foreign trade. This is because, despite the fact that government expenditures have a larger component of nontraded goods than the private expenditures taxed away, the strong influence on the price of the home good only occurs when the substitution between imports and domestic goods in production and demand is low due to import restrictions.

The effect of the fiscal deficit financed by borrowing is more pronounced when the economy is financially open, *i.e.* when there is no black market premium on foreign exchange. The increase in deficit pumps in foreign financing and produces either a decline in the nominal rate of exchange, or an increase in domestic prices, or a combination of both effects. When domestic financial markets are completely closed, *i.e.* when the black market premium is very large, financing the deficit by borrowing produces a very strong crowding-out effect on private expenditures.

The effect of money supply and nominal exchange-rate management also depends on the openness of the economy. When the economy is financially very open, monetary expansion over and above the value of income valued at foreign prices affects the real exchange rate with an elasticity of -0.44. This means that a 10 per cent increase in μ produces a 4.4 per cent reduction in the real rate of exchange. The elasticity becomes larger in absolute value when the economy is more closed to financial transactions with the rest of the world. This is because financial openness will dampen the real effect of nominal shocks in the money supply or in the exchange rate since there will be a quick response of capital inflows or outflows to such shocks. This dampening effect does not operate when the flows are obstructed and a large black market premium is created.

Degree of Sectoral Tradability

In dealing with sectoral analysis it should be kept in mind that a sector is often both importing and exporting at the same time. This suggests that the sector is heterogeneous. Such heterogeneity is unavoidable when sectors are broadly defined. To deal with the problem explicitly, it is assumed that each sector can be subdivided into three subsectors: a) domestic production of goods actually exported, b) domestic production of goods actually imported, and c) domestic production of nontraded goods.

The aggregate price for sector j, P_j, can be represented as an average of P_x, P_m, and P_h . Using a geometric aggregation and ignoring the sectoral index, j:

$$P = P_x^{\alpha_1} P_m^{\alpha_2} P_h^{(1-\alpha_1-\alpha_2)}, \qquad (11)$$

where α_1 and α_2 are some functions of the quantities in question.

Sectoral Prices

In the case of Argentina, imported goods constitute an almost negligible proportion of agricultural output and the same holds for the exported goods of non agriculture. Incorporating this into equation (1) the price for sector j, j=1, 2 is approximated by:

$$P_j = P_{jT}^{\alpha_j} P_{jh}^{1-\alpha_j}, \text{ where } P_{jT} = P_j^* E(1+t_j), \qquad (12)$$

Equivalently:

$$p_j = p_{jT}^{\alpha_j} \qquad (13)$$

where $p_j = (P_j / P_{jh})$, $p_{jT} = (P_{jT}/P_{jh})$, and α_j indicates the share of the traded component and as such it constitutes a measure of the degree of tradability (DT). The DT depends on economic variables which generate changes in supply and demand, but in the first place they should reflect the degree of openness of each sector. This is allowed for in the empirical analysis by allowing α_j to depend on the degree of sectoral openness (DOj):

$$\alpha_j = \alpha_j^* + \beta_j \ln(DO_j).$$

DOj is computed as the share of total trade in sectoral income.

The prices P_1, P_2, P_{1T}, and P_{2T} are observed, but there are no observations on P_{1h} and P_{2h}. The empirical analysis is carried out under the assumption that P_{jh} are related to P_3, the price index of government services. This relation depends on macro policies which affect the demand for domestic goods. The following specification is used:

$$\ln(P_{jh}/P_3) = h_j \ln(MPI) \qquad (14)$$

where h_j is a vector of coefficients specified below and MPI denotes a vector of macro policy variables. Combining (13) and (14) an estimable function for P_j / P_h is obtained:

$$\ln(P_j / P_3) = \alpha_j \ln(P_{jT} / P_3) + (1 - \alpha_j)\, h_j \ln(MPI) \qquad (15)$$

Equation (15) was estimated for sectors 1 and 2 in first differences because the regressions in levels were subject to a strong serial correlation in the error terms.

Results

The estimated regressions are summarized in Table 3.2 for sector 1 and in Table 3.3 for sector 2. By definition, the coefficient α is the share of traded output in sector j. Therefore, the α's obtained from the estimation of (15) are the shares of traded output in agriculture and nonagriculture. These values are plotted in Figure 2.8.

Agriculture has always been a more highly traded sector than nonagriculture. Before 1930, the traded component of agriculture oscillated around 75 per cent, while that of nonagriculture was about 55 per cent. These were the highest values of α in both sectors and reflected the existence of an open trade regime. From that year until the beginning of the 1950s, a decreasing trend in the traded component is observed as the economy turned to a more restricted trade regime. This trend was briefly interrupted in the years immediately following World War II, mainly as a result of the extraordinary boom in world trade when Argentina had exceptionally high levels of grain stocks. During the period 1947-54, the values of α reached their lowest values. After 1955, agriculture reversed this trend and progressively became a more traded sector. By the 1980s, the composition became similar to that which had prevailed before 1930. However, nonagriculture continued to operate under a much more closed regime. Since 1955, the traded component of output in sector 2 has been about 42 per cent.

The Degree of Commercial Openness

The degree of openness reflects government decisions and world market conditions and as such it is exogenous within our framework. However, the measure of

openness itself used in the analysis involves endogenous variables and this should be allowed for in the empirical analysis.

The commercial openness of the economy is measured as the share of total trade in total income. The variable is plotted in Figure 3.2. Note the significant reduction in trade that took place after the Great Depression. This was the natural outcome of adopting high taxes on foreign trade, imposing quantitative restrictions on imports and controls on foreign exchange, and increasing government expenditures and fiscal deficits. These government policies were implemented to attenuate the effects of the world depression and were similar to policies adopted by most other countries. However, this declining trend in trade continued up to 1955, except for the short interregnum of 1946-47, when high world demand for Argentine exports increased the value of trade to about 40 per cent of total income. During subsequent postwar years, there was a revival of world trade, but Argentina deepened its restrictions on trade. This is reflected in the historical minimum of the value of trade of about 20 per cent during 1952-55. Since 1956, this value has oscillated between 20 and 25 per cent.

During the postwar period, macroeconomic policy was characterized by higher government expenditures, higher fiscal deficits, and increased volatility in the rate of monetary expansion. Restrictions on financial transactions with the rest of the world were imposed more intensely. Commercial policy was instrumented more in the form of quantitative restrictions than in the taxation of imports and exports that had prevailed during the prewar period.

Following the foregoing description, it is postulated that the degree of commercial openness depends on commercial policy, on the degree of financial openness, DOf, and perhaps on other determinants. More formally:

$$DOc = f(\text{commercial policy}, DOf, \ldots).$$

To estimate this equation, it is necessary to distinguish between the two forms in which commercial policy was instrumented in Argentina: on the one hand, export and import taxes, and on the other, quantitative restrictions. No annual data are available for the quantitative restrictions. Therefore, macropolicy indicators are introduced in the empirical equation to capture effects of commercial policies other than those represented by T_j. The degree of financial openness is measured, as before, as the inverse of the black market premium on foreign exchange. The result is:

$$\log DO_c = \underset{(4.2)}{-0.516} + \underset{(4.0)}{0.648}\log\left(T_x/T_m\right) - \underset{(4.2)}{0.170}\log g - \underset{(8.3)}{0.590}\hat{\mu} \qquad (16)$$

$$+ \underset{(4.0)}{0.146}\log\left(DO_f\right) + \underset{(18.1)}{0.770}\log\left(DO_c\right)_{-1}$$

$$R^2 = 0.97; \text{ D.W.} = 1.93.$$

Simultaneous Estimation

It is now possible to assemble the equations for the degree of commercial openness, the real exchange rate, the relative prices for agriculture and nonagriculture (excluding government), and build a system that is estimated simultaneously using 3SLS technique. The results are reported in MCD, (1989) and, in general, they are very similar to the OLS estimates. The fit of the system as determined by static simulation are presented in Figures 3.2 - 3.5. Clearly, the simulated values fit the data very closely. We present the results of the static simulation because in time t agents have all the information that was accumulated to that time, including lagged prices. Static simulation cannot, however, be used for policy simulation because the introduction of policy shocks changes the dynamic paths of prices. Hence, in evaluating policy

changes, dynamic simulations are used. Those are not shown here, but it is noted that they capture well the main cycles in the various variables.

The Response of Prices to Trade Liberalization

The system is used to simulate the response of the endogenous variables to a programme of trade liberalization that is implemented together with consistent macroeconomic policies. The timing and sequencing of changes in commercial policies combined with the consistency of accompanying macroeconomic policies are of crucial importance for the success of a trade liberalization programme. Cavallo and Cottani, (1986) showed that the attempt to open the Argentine economy in the late 1970s failed mostly due to the inconsistent and inappropriate policies that were followed.

The trade liberalization exercise is carried out for the following set of commercial and macroeconomic policies:

Commercial Policy - Modifications in commercial policy are introduced in the year 1930. They consist of eliminating completely taxes on exports ($T_x = 1$) and setting a uniform tariff on imports of 10 per cent ($T_m = 1.1$). These values can be compared with the actual values plotted in Figure 2.5.

Macro policy - It is assumed that public expenditures followed their historical levels except for two periods in which drastic jumps took place. These jumps were modified in the simulation. Thus, between 1946 and 1953 public expenditures are assumed to grow smoothly, and between 1974 and 1984 it is assumed that they remained at the level of 1973. These values of g are plotted in Figure 3.6.

Figure 3.7 plots the imposed values for fiscal deficits financed by borrowing and the actual levels. The imposed free trade values are calculated under the following assumptions: a) the deficit declines by the same amount as the reduction in government expenditures, b) the level financed by monetization remains unchanged. Therefore, borrowing also declines by the same amount as government expenditures.

The rate of growth of μ is held at the average historical level of -.008 and it is assumed that the system is financially open so that there is no black market premium on the exchange rate.

Figures 3.8 to 3.11 compare the simulated values of the endogenous variables with the base run values. As can be seen by inspecting these plots, relative prices respond strongly to trade liberalization. This response is quantified in Table 3.4 where the percentage increases in the "free-trade" values relative to the actual values are reported for the endogenous variables.

These results imply that if the Argentine economy had been more integrated with the world economy after 1929, the volume of trade would have been almost 70 percent higher than its actual level. Moreover, Argentina would have had an economy where relative prices would have been more in line with international prices. This would have implied much greater price incentives for both agriculture and nonagriculture relative to the expansion of government services. Therefore, for the period 1930-84, the price of agriculture would have been, on average, 40 per cent higher and the price of private nonagriculture would have been almost 20 per cent higher. In the two cases the sectoral prices are relative to the price of government services. Of course, a greater supply of agricultural and nonagricultural goods (excluding government) could have caused the changes in relative prices to be of a lesser magnitude.

CHAPTER 4

OUTPUTS, INPUTS AND FACTOR PRICES

Production Function

Technology is a key concept for evaluating the changes that an economy is undergoing in the short and the long run. Ordinarily, in most economic analyses, it is assumed that at any time the economy has a single production function. Technical change is perceived as a change of this function. This is a very innocent and simple minded view of the world. Clearly, looking at any sector of the economy, one can find numerous ways of producing a given product. Neglecting this simple fact leads to a distorted view of the world. From our point of view, the main source for this distortion is related to the fact that when there is a choice of techniques, economic considerations dictate the choice. Consequently, the set of the techniques which are implemented at any time reflects the conditions at that time. How does it differ from the standard approach? The standard approach assumes that the economic conditions determine only the location of the agents on a given production function, whereas in the present analysis, this is extended to allow for a choice of the implemented technique. This way, the market conditions have a much stronger influence on the economy. This is relevant not only for explaining the past but also in trying to understand how a change in economic environment is likely to affect the future development of the economy.

This view was also pursued in our previous analyses (Cavallo and Mundlak, 1982, Mundlak, Cavallo and Domenech, 1987) and it plays a key role in the present work. The theoretical and technical details have been discussed in Mundlak, (1987, 1988 and 1989).

This framework leads to the following formulation of the production system:

$$y_j = \Gamma_j + k_j \beta_j \tag{17}$$

$$\Gamma_j = z.\ \pi_{0j} + e_0 \tag{18}$$

$$\beta_j = z.\ \pi_{1j} + e_1 \tag{19}$$

where y_j is the log of the output-labor ratio in sector j, k_j is the log of the capital-labor ratio in sector j, z is a vector of state variables, π's are parameters to be estimated, e_0 and e_1 are disturbances and $z.\pi$ implies (inner) vector product.

Note that the production function has the Cobb Douglas form with one major modification, the coefficients depend on state variables, z. The state variables can be grouped as follows: a) available technology, b) constraints, c) expected prices, d) risk, and e) cost of adjustment. All of these are considered to be state variables in the sense that they are given exogenously to the firm.

State Variables

Technology and Capital Constraint

By its very nature, technology is an abstract concept and at the macro level it is unobserved directly. The evidence on it is primarily circumstantial. The same difficulty applies to a complete description of technical change. Conceptually, technical change is achieved by a change in the set of available techniques which implies appearance of

new techniques. There is, however, a general observation to be made that on the whole, the development of new techniques requires resources and, as such, the level of their production is directly related to the availability of resources, or simply to the capital stock, broadly defined, including human capital.

This describes the supply side of new techniques. Turning to the demand side, it is recognized that on the whole new techniques are capital intensive and therefore their implementation is paced by the availability of capital. Thus, the implemented technology is expected to be directly related to the capital stock in the country. The essence of this discussion is that countries with larger capital stock are expected to be more productive than countries with low capital stock because they are able to produce and implement more productive techniques. The same relationship is expected to hold over time for a given country.

At a less abstract level, it is possible to obtain a more direct view of the available technology by making cross country comparisons. In the case of agriculture, we constructed a partial measure of available technology by taking a ratio of Divisia index of yields in Argentina and the United States, with weights obtained from the crop composition in Argentina. The yields are plotted in Figure 2.1.

Profitability

The expected profitability depends on the demand conditions. To simplify things, sectoral demands are not explicitly formulated. The repercussions of this are not the same for the two sectors. Agricultural prices have a large tradable component and therefore agricultural price or a measure of the real rate of exchange can be used to represent the demand. On the other hand, the tradable component in the output of nonagriculture is smaller than in agriculture and, therefore, the price itself is insufficient to represent the demand. Specifically, the demand for nonagriculture is affected by the government expenditures. This effect is introduced into the analysis through a measure of the government share in total output. In both sectors, the demand is affected by overall macro shocks. In addition, there is cross sectoral effects of output which in part represent demand for intermediate products.

Fluctuations in demand generate uncertainty with respect to future conditions. This affects the cost and the accuracy of forecasting. Furthermore, since investment is made for a long period of time, its efficiency tends to decline with the fluctuations in the economy because techniques should be versatile to cope with extreme market conditions. To allow for all these, the actual fluctuations in prices are introduced here directly by the standard deviation of sectoral prices in the past 3 years.

Estimation

No direct observations are available on β and Γ and their values are inferred. The factor share of capital replaces β.

Γ_j is derived from the production function identity (17) as a residual where β_j is replaced by the factor share or by its estimate.

Results

There is no simple way to present and compare results of alternative specifications for several reasons. There are four equations with several state variables in each. Each state variable appears in two equations, one for the slope and one for the level. Also, the model is both joint and dynamic and the response of output to a change in a state variable is a sum of several effects. Not all state variables are purely exogenous. Thus, a change of an exogenous state variable may affect the values of other state variables. Such changes also affect the value of the capital labor ratio. This

can be seen by evaluating the elasticity of average labor productivity with respect to a given state variable (say z_i):

$$\frac{\partial y_j}{\partial z_i} = \sum_h \left[\frac{\partial \Gamma_j(z)}{\partial z_h} + k_j \frac{\partial \beta_j(z)}{\partial z_h} + \beta_j(z) \frac{\partial k_j}{\partial z_h} \right] \frac{\partial z_h}{\partial z_i} \tag{20}$$

The first two terms in the brackets show the response of the implemented technology to a change in the state variables, whereas the last term shows the input response under constant technology. The innovation in the present formulation is in the response of the implemented technology. A full evaluation of (20) requires a solution of the model. This is done below where the complete model is put together for the particular specification that is used for the policy simulation.

A detailed listing of all the coeficients is given in MCD, (1989). The fitted values of these equations are shown in Figures 4.1 - 4.6. The first thing to note is the great volatility of the capital shares. There are two approaches to account for such volatility. One is to attribute the variations in the share of capital to the changes in factor proportions. This is the approach taken by extending the Cobb Douglas function to include interaction terms such as the translog function. This approach was not helpful in our particular case. The second approach is the one taken here, it attributes the variations in the share to variations in the state variables. The two, of course, are not mutually exclusive, and it is possible that the shares depend on factor proportions as well as on the state variables. Again, this was unnecessary here.

Factor prices

The estimation of the production system produces estimates for factor shares. Those are assumed to equal the production elasticities, from which the value marginal productivities are easily derived. Factor prices are assumed to equal the value marginal productivities.

The price of land appears explicitly in some equations. In simulating the model, the price of land was taken to be exogenous, but it was endogenized in the policy simulation by using the following equation:

$$\log\left(\frac{P_a}{P}\right) = \underset{(1.9)}{.4093} + \underset{(2.1)}{.1760} \log(r_1) + \underset{(8.2)}{.9635} \log\left(\frac{P_a}{P}\right)(t-1) \tag{21}$$

$$- \underset{(1.8)}{.2075} \log\left(\frac{P_a}{P}\right)(t-2), \qquad \bar{R}^2 = .72.$$

where P_a is the price of land and r_1 is the rate of return in agriculture.

Capital

Investment Function

The treatment of investment determines to a large extent how the model is closed. Here, as in our previous work, we allow foreign savings (or net imports) to be a residual and introduce an autonomous investment function for the aggregate private sector, agriculture and nonagriculture (excluding government) combined. We differentiate between private and government investment. The two types of investment are determined by different criteria. The present analysis deals with private investment, taking government investment to be exogenous.

Private investment is assumed to depend on the expected rate of return to capital in the private sector (r_p^e), on the change in output of the private sector (D[Y_p/N]) and on government investment (I_3). To the extent that government investment expands the infrastructure, it increases the productivity of private investment. In this case, we expect to have positive effect of government investment on private investment.

There is no time series for the rate of interest over the entire period. Thus, we focus our attention on the fiscal deficit. When the government runs a deficit and finances it by borrowing, the rate of interest will tend to increase and crowd out private investment. This is a well known effect which applies to a closed economy. An open economy can borrow from abroad, but as the stock of government debt, either domestic or foreign, increases the government's need to borrow in order to meet the interest payments, and that in turn increases interest. Thus, ultimately, the crowding out effect can be observed in open economies as well.

The estimated function is:

$$I_p/\mathrm{N} = \underset{(2.2)}{-1.06} + \underset{(3.7)}{17.8}\, r_p^e + \underset{(7.8)}{.372}\, \mathrm{D}[\mathrm{Y_p}/\mathrm{N}] + \underset{(3.0)}{.591}\, I_3/\mathrm{N} \qquad (22)$$

$$- \underset{(2.0)}{.110}\, f^b/\mathrm{N} + \underset{(12.8)}{.693}\, I_p/\mathrm{N}\,(t-1), \qquad \bar{R}^2 = .95$$

where I_p combines the investment of sector 1 (agriculture) and sector 2 (nonagriculture excluding government), r_p^e is the expected rate of return of sectors 1 and 2 combined. It was computed as the fitted values of an AR(3) process for a measure of observed rate of return. The rate of return was computed as the nonwage income in sectors 1 and 2 combined divided by the stock of capital of these two sectors. D[Y_p] is the first difference of gross factor income in sectors 1 and 2 combined, I_3 is government investment, f^b is the fiscal deficit financed by borrowing at constant prices, and N is population.

The results show that investment increased with the expected rate of return and with a change in output. The effect of government investment is positive. This is consistent with the view that expansion of infrastructure increases the productivity. However, there is a counterpart to this positive effect of government investment. The fiscal deficit financed by borrowing exerts a negative effect on private investment.

The Dynamics of Sectoral Capital Accumulation

Sectoral capital varies from time t to time t+1 according to the rate of sectoral investment, allowing for depreciation. In symbols, the stock of capital in sector j is determined as:

$$K_j(t) = K_j(t-1)\,(1-\delta_j) + \theta_j(t)\,(I_p(t) + I_3(t)), \qquad (23)$$

where δ is the rate of depreciation, θ_j is the proportion of sector j in total investment. I_3 is taken to be exogenous, I_p is determined in (22). In order to obtain a complete description of the dynamics of capital accumulation, it is necessary to determine $\theta_j(t)$.

Intersectoral Allocation of Investment

Given total investment, the allocation to the various sectors depends on the sectoral rates of return. This relationship can be derived from an intertemporal

optimization process with an external cost of adjustment (Mundlak, 1986, Cavallo and Mundlak, 1989).

The empirical analysis consisted of regressing the logarithm of the share of agriculture in total investment on the share of agriculture in the capital stock, θ^k , and the differential rate of return, r_2 / r_1. The latter was decomposed into an anticipated part, $(r_2/r_1)^e$, obtained from an AR(2) process, and an unanticipated part, $(r_2/r_1)^u$, which is the difference between the actual and the anticipated ratio. The share of agriculture in the capital stock is introduced here to scale the investment (Cavallo and Mundlak, 1982). The regression also included the dependent variable lagged one year. The function was estimated simultaneously with the equations for investment, consumption, and cultivated land.

$$\log \theta = \underset{(.6)}{-.058} + \underset{(1.9)}{.255}\log \theta^k - \underset{(1.9)}{.140}\log (r_2/r_1)^e \qquad (24)$$

$$- \underset{(1.7)}{.170}\log (r_2/r_1)^u + \underset{(7.6)}{.732}\log \theta (t-1), \quad \bar{R}^{-2} = .90.$$

The most important result is the strong effect of the differential rate of return on the allocation of investment.

Cultivated Area

The stock of capital that enters in the production function for sector 1 includes land. It is computed as a Divisia index of the stock of physical capital and the cultivated area, weighed by the price of investment goods, and the price of land respectively. Therefore, in order to obtain $K_1(t)$ it is necessary to explain how the cultivated area is determined.

The size of the cultivated area is postulated to be positively affected by the real price of land, P_a/P, by the terms of trade of agriculture, measured here by the intersectoral differential rate of return to capital, r_2/r_1, and negatively by credit restrictions on agriculture, CR. Cultivated land does not include pasture which constitutes an alternative use of land for livestock raising. Therefore, the use of land should also be negatively affected by the price ratio of livestock to crops, P_l/P_c.

With the exception of the differential rate of return, the variables have the expected sign and are significant. It thus appears that the price of land and the price ratio of livestock to crop contain all the relevant information that the rates of returns have for determining the size of the cultivated land.

Labor

The Dynamics of Sectoral Employment

The employment in sector j at time t is obtained by augmenting the employment at time t-1 by the rate of growth of the labor force and adjusting for the rate of occupational migration. Total population is assumed to grow at the exogenous rate n. The empirical analysis aims at explaining the intersectoral labor migration and the total growth of the labor force.

Labor Migration

The empirical formulation of the migration equation follows Cavallo and Mundlak, (1982). The empirical equation is:

$$\ln m(t) = -\underset{(6.6)}{(10.1)} + \underset{(2.8)}{5.58}\log(W_2/W_1)(t-1) - \underset{(2.2)}{1.29}\ln(P_a)(t-1) \quad (25)$$

$$-\underset{(2.1)}{0.83}\log(U)(t-2); \bar{R}^2 = 0.95.$$

The intersectoral income differential is measured as the wage ratio in nonagriculture, excluding government, to that in agriculture lagged one year $(W_2/W_1)(t-1)$. As expected, an increase in the income differential in favor of nonagriculture, increases the rate of off farm migration. The price of land, P_a, lagged one period had a negative effect on migration. This implies that better prospects for profitability, reflected as a rise in the price of land, decrease the migration rate. The ratio of the labor force in agriculture to that in nonagriculture turned out to be statistically insignificant and was dropped from the regression. Instead, migration was affected by the level of activity in sector 2. This variable was measured as the ratio of the actual to the historical peak of output in sector 2. It is introduced with a two year lag, U(t-2). For convenience, it is referred to as urban unemployment although the two are not the same. The negative sign indicates that the decline in the level of activity in nonagriculture was associated with a decline in migration.

Employment

The level of employment is determined by labor supply and demand, and possibly, by some institutional arrangements. In what follows we present a reduced form equation that was used to generate variations in the level of employment:

$$L/N = \underset{(8.7)}{.278} + \underset{(2.3)}{.165}\, w^p(t-1) - \underset{(2.1)}{.031}\, w^g(t-1) + .104\, DC, \quad R^2 = .84. \quad (26)$$

where w^p and w^g are the wage rates in the private and government sectors respectively and DC is a dummy variable that takes the value one for census data and zero for annual data.

CHAPTER 5

SIMULATING THE EFFECT OF POLICY CHANGES

Policy changes that affect economic incentives cause changes in the pace of resource growth and allocation. The analysis in Chapters 3 and 4 established the relationships between policy changes and economic incentives and provided the pertinent empirical results. These results are assembled to build a sectoral growth model of the Argentine economy. The construction of a complete model requires that the number of independent equations and identities be equal to the number of endogenous variables. A detailed description of the complete model with all the equations and identities can be found in MCD, (1989). The model is confronted with the data and selected results are presented in Figures 5.1 - 5.6. In order to explore the dynamic properties of the model, supply response experiments are conducted using dynamic simulation. The choice of a supply response experiment is not accidental. This is an extremely important subject by itself and it is also crucial for understanding the policy discussion below.

Supply Response

We present here an exercise which consists of an exogenous change of a permanent 10 per cent increase in agricultural prices, P_1. This increase in P_1 is matched by the necessary adjustment in the price of government services, P_3, in order to keep the economy's price level, P, at its historical levels. On average, P_3 was reduced by 11 per cent. The price of land was increased by the same proportion as P_1. The computed elasticities of some of the endogenous variables are reported in Tables 5.1 and 5.2 for selected periods. The results indicate very clearly that agriculture responds to prices, but that it takes time for the response to build up. In three years, output moves up by 30 per cent of the price change and the increase exceeds 70 per cent after 15 years. The response converges in a 20-year time span, to 99 per cent of the price change. This is equivalent to an elasticity of 0.99. The response results mainly from capital accumulation and from an increase in productivity.

An important result is that changes in agricultural prices also have a strong positive impact on nonagricultural output. It is a well known phenomenon in Argentina that when agriculture prospers, so does the rest of the economy. In terms of the present model, there are several reasons for this strong effect. First, the improvement in agricultural prices increases the rate of return in agriculture and this in turn leads to higher investment in the private sector, which is shared by non agriculture. Second, this particular experiment results in an increase of P_2/P_3 which in turn supplements the effect of the price increase in agriculture. Finally, due to the cross output effects in the production function, the increase in agricultural output has a favorable effect on non agricultural output.

The strong response of the two sectors is well reflected in the response of total output in the economy as can be seen in Table 5.2.

Policy Simulation

In MCD, (1989), three important periods in Argentine economic history are analyzed in order to evaluate the cost in terms of long term growth of the economic policies that were applied to cope with external shocks or short terms economic goals. In general, the studies of economic historians suggest that different policies to those

that were actually applied could have produced a better performance (Diaz Alejandro, 1969, Mallon and Sourrouille, 1973, Cavallo and Mundlak, 1982). To address these issues, the model is used to compare the trajectories the economy could have attained under alternative economic policies. The costs of the policies applied are evaluated by separating the effects of macroeconomic policy from those that can be attributed to trade policies.

The first episode begins in 1929 and goes through the end of the thirties. Here, the analysis examines how economic policy reacted to face the drastic disruption in world trade that was caused by the Great Depression. The second episode goes from 1946 to the mid-fifties. Here, attention is paid to the income distribution program implemented by President Peron during his first and second administrations. Finally, the third episode goes from 1970 to the mid-eighties covering a period of very contradictory policies that first were aimed to deepen the import substitution process and redistribute income in favor of labor, but later were changed in the opposite direction at a time of extreme macroeconomic instability and excess liquidity in world financial markets.

Based on these analyses, we turned to examine what growth trajectory is embeded in our model under the set of the alternative policies.

Argentina Integrated to the World Economy

The single most striking characteristic of Argentine economic history is the long-lasting reversal in its once large share in world trade and finance. Prior to the Great Depression and for several decades, Argentina's growth had been tightly integrated in the world economy. However, since 1929 and due to a combination of external shocks and internal decisions, the economy turned inwards and became less and less integrated to world trade and capital markets.

The costs in terms of long-term growth of the inward-looking strategy followed after 1929 have been the subject of heated debates and discussions among students of Argentine economy (Diaz Alejandro, Ferrer, Mallon and Sourrouille, Cavallo, De Pablo, LLach, Diamand, Frigerio). Two antagonistic positions emerged. On the one hand, the view that supports the strategy actually followed and on the other, the position that claims that it was detrimental. To address this controversial issue, the model is used to simulate the trajectory of the economy under a set of policies designed to preserve the outward-looking strategy that prevailed before 1930. The results are then compared to the actual trends.

Regarding fiscal policy, public expenditures were adjusted in the same way as used in the exercises for 1946-55 and 1970-84, namely, avoiding the sharp increases that were not sustainable in the longer run. Reducing public expenditures reduced the need for borrowing, therefore, in this simulation, the fiscal deficit financed by borrowing was adjusted accordingly. The monetary-exchange policy was designed to stabilize μ at the average level actually observed during the period 1930-84. The structural scenario of an open economy was simulated by imposing a uniform and constant tariff on imports of 10 per cent, no taxes on exports, and the elimination of quantitative restrictions and exchange controls which amounted to have no premium in the black market for foreign exchange[5]. The results of this simulation exercise are shown in Table 5.3. As it can be seen, relative prices strongly responded to the policy changes. On average, during the 55-year period, agricultural prices would have been 45 per cent higher and nonagricultural prices 20 per cent higher, in both cases relative to the price of government services. By the end of the period, agricultural output would have more than doubled its historical level as a consequence of both input expansion and productivity growth. Employment in agriculture would have increased by 64 per cent,

physical capital by 59 per cent, and cultivated land by 37 per cent. In private nonagriculture, output would have increased by 65 per cent with a small decline in employment and a 50 per cent increase in the stock of capital.

To allow for such a resource growth and reallocation in the private sectors of the economy, employment in the government sector would have been 35 per cent lower. This decline in government employment is consistent with the same level of government services, under the assumption that labor productivity in this sector increases at the same rate as in the rest of the economy.

The figures for the overall economy are quite impressive. Total output would have been 63 per cent higher, investment would have doubled and exports almost tripled.

The only result that does not seem to agree with this favorable performance are urban wages. While in agriculture wages increased by 26 per cent by the end of the period, in nonagriculture and government they are 6 per cent above the historical levels. This problem is discused in MCD, (1989) where it is indicated that these wages do not capture the returns to human capital which in turn are captured by the returns to capital. In any case, with the existence of well-developed economic institutions, the achievement of income redistribution goals should not be a difficult task to meet in an economy with such impressive growth potentials.

These results have all the limitations that econometricians are well aware of when working with simulations involving large policy changes. With this *caveat*, the results can be put in a perspective which will allow the reader to judge their relevance for himself. Figure 5.7 plots the actual trajectories of total output in Argentina, Australia, and Canada, together with the trajectory of the output that the model predicts for Argentina under free trade and macroeconomic discipline. The outcome of the more appropriate policies, is that Argentina's performance could have been very similar to the countries which are similarly endowed that continued to take advantage of opportunities offered by the world markets.

NOTES AND REFERENCES

1. A similar equation was estimated for other countries.
2. See for instance the reviews by Dornbusch, (1986) and Snape, (1989).
3. On this, see Cavallo and Mundlak, (1982), Cavallo and Garcia, (1985), Cavallo, (1986) and Mundlak, Cavallo and Domenech, (1987).
4. This becomes clear from Cavallo, (1986a).
5. In addition, it was assumed that bankruptcies that occurred during 1931-32 and 1981-82 were nonexistant while the shocks of deflation and inflation were imposed the values of zero. To explain the implications of such changes requires a more detailed discussion. On this, see MCD, (1989).

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Table 2.1

Comparative growth in income and population
(Average annual rates in percentages)

	Argentina	Australia	Brazil	Canada	U.S.
(i) Period 1900-04 to 1925-29					
Population	2.8	1.8	2.1	2.2	1.1
Income	4.6	2.6	3.3	3.4	2.9
Per capita Income	1.8	0.8	1.2	1.2	1.3
(ii) Period 1925-29 to 1980-84					
Population	1.8	1.7	2.5	1.5	1.3
Income	2.8	3.9	5.5	3.9	3.1
Per capita Income	1.0	2.2	3.0	2.4	1.8

Source: Cavallo, D., "Argentina" in R. Dornbusch and F.L Helmes (eds.), *The Open Economy, Tools for Policy Makers in Developing Countries.* EDI Series in Economic Development, Washington D.C, the World Bank, 1986, The dynamics of this process, MCD (1981)

Table 2.2

Sectoral shares of capital
(1913-84)

Sector	Average	Standard Deviation	Maximum	Minimum
Agriculture	0.60	0.10	0.78	0.31
Nonagriculture excluding government	0.42	0.10	0.69	0.19

Note: Computed as one minus the ratio of the sector's labor income to the sector's total income.

Source: MCD (1989)

Table 2.3

Sectoral degree of tradability
(1913-84)

Sector	Average	Standard Deviation	Maximum	Minimum
Agriculture	0.67	0.06	0.81	0.53
Nonagriculture excluding government	0.47	0.04	0.56	0.42

Source: MCD (1989)

Table 3.1

Estimation of the real exchange rate equation
1916-1984

Variable	Coefficient	Average Value of the Coefficient
$\hat{P}_x - \hat{P}_m$	$0.72 + 0.29 \log DO_c$ (5.1) (2.5)	0.37
$\hat{Y}$	0.24 (1.6)	0.24
$\hat{g}$	$0.43 \log DO_c$ (6.7)	-0.52
$\hat{f}$	$-1.69 - 2.04 \log DO_f$ (3.7) (-2.3)	-1.13
$\hat{\mu}$	$-0.44 + 0.02 \log DO_f$ (5.1) (2.1)	-0.45

Note: The dependent variable is $\hat{P}_x - \hat{P}_n$. The intercept of the equation is 0.02 with a t-ratio of 1.6; the coefficient of the degree of openness (DO_c) is 1.39 with a t-ratio of 8.1, $\bar{R}^2$ is 0.87; and the Durbin-Watson statistic (D.W.) is 1.65; t-ratios are in parentheses.

Table 3.2

Price of agricultural goods relative to the price of government services, 1916-1984.

Variable	Dependent Variable: $\hat{P}_1 - \hat{P}_3$		
	Estimated Coefficient	Estimate	Average Value of the Coefficient
$\hat{P}_{1T} - \hat{P}_3$	$\alpha 1$	0.60 +0.16 log DO_1 (6.3) (2.1)	0.67
$\hat{g}$	$(1-\alpha_1)h$ 1 g	-0.77 (5.6)	-0.77
f	$(1-\alpha_1)h$ 1 f	-0.33 (-1.0)	-0.33
$\hat{\mu}$	$(1-\alpha_1)h$ 1 m	0.17 (1.8)	0.17

Note: t-statistics are in parentheses. The constant is 0.03 and its t-ratio is 2.4. $\bar{R}^2 = 0.82$; D.W. = 1.90.

Table 3.3

Price of nonagricultural goods relative to the price of government services, 1916-1984.

Variable	Dependent Variable: $\hat{P}_2 - \hat{P}_3$		
	Estimated Coefficient	Estimate	Average Value of the Coefficient
$\hat{P} - \hat{P}$	α_2	0.52 +0.06 log DO_2 (6.3) (1.2)	0.48
$\hat{g}$	$(1-\alpha_2)h_g$	-0.60	-0.60 (-6.9)
f	$(1-\alpha_2)h_f$	-0.42 (-1.9)	-0.42
$\hat{\mu}$	$(1-\alpha_2)h_m$	0.27 (3.7)	0.27

Note: t-statistics are in parentheses. The constant is 0.02 and its t-ratio is 2.8. $\bar{R}^2 = 0.79$; D.W. = 1.94.

Table 3.4

Response of relative prices to trade liberalization
(1930-1984)

Variable	Base Run (1)	Simulated (2)	Percentage Increase
Degree of commercial opennes (DO_c)	0.24	0.40	67
Real rate of exchange (e)	0.54	0.82	52
Relative price of agriculture (P_1/P_3)	0.68	0.95	40
Relative price of nonagriculture (P_2/P_3)	0.77	0.91	18

Note: Last column is obtained by [(2)/(1) - 1] 100 where (2) and (1) represent entries in these columns respectively.

Table 5.1

Price elasticities of output, labor, capital, and land in agriculture - Experiment 1

Period	Output	Labour	Physical Capital	Land
1	0.19	0.00	0.05	0.03
2	0.24	0.06	0.12	0.06
3	0.31	0.14	0.19	0.08
4	0.38	0.19	0.24	0.11
5	0.43	0.21	0.30	0.14
10	0.51	0.26	0.65	0.27
15	0.73	0.15	1.07	0.41
20	0.99	0.02	1.45	0.56

Note: The elasticities are computed by imposing a 10 per cent increase in the price of agriculture compensated by a decline of the price of government services in order to keep the general price level constant. The price of land is increased in the same proportion as the agricultural price.

Table 5.2

Price elasticities of output, labor and capital in private nonagriculture, and in the total economy

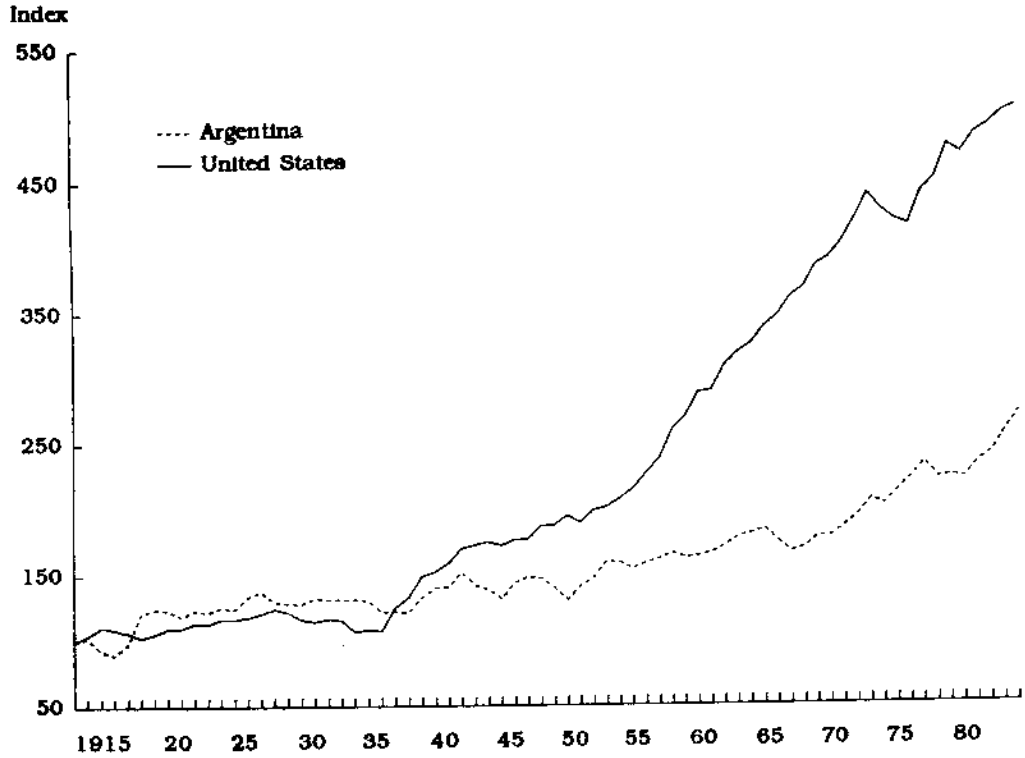
	Private Non-agriculture			Aggregate Economy		
Period	Output	Labor	Capital	Output	Labor	Capital
1	0.42	0.00	0.09	0.33	0.00	0.06
2	0.72	0.43	0.24	0.55	0.26	0.15
3	0.75	0.35	0.37	0.60	0.22	0.23
4	0.79	0.38	0.49	0.63	0.24	0.31
5	0.74	0.29	0.60	0.61	0.19	0.39
10	0.64	0.06	1.01	0.56	0.02	0.72
15	0.83	0.02	1.24	0.73	-0.05	0.95
20	1.08	0.06	1.34	0.96	-0.07	1.08

Table 5.3

Effects of alternative economic policies, 1930-1984
(Percentage change with respect to base-run values)

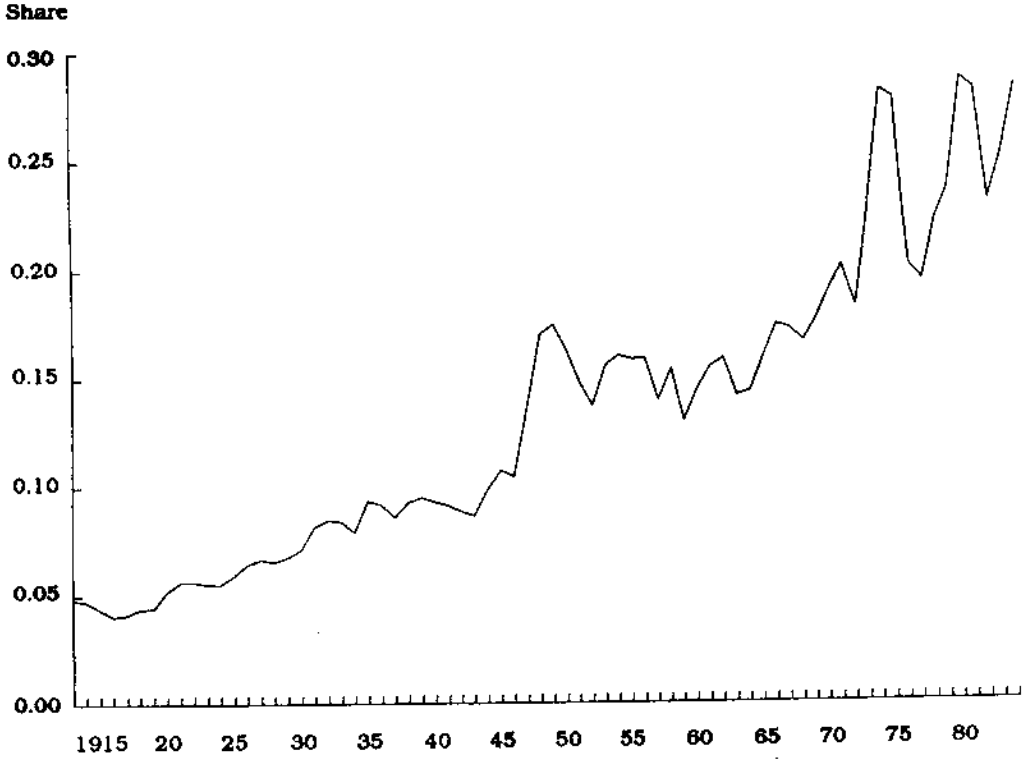
Endogenous Variables	Average Annual Response: Changes in Monetary, Exchange and Fiscal Policy	Average Annual Response: All Policy Changes	Response in Year 1984: Changes in Monetary, Exchange and Fiscal Policy	Response in Year 1984: All Policy Changes
Relative prices				
Price of land	9	29	32	46
Degree of openness	4	77	1	57
Real exchange rate	12	70	72	59
P1/P3	12	45	72	81
P2/P3	11	20	56	53
Agricultural sector				
Labor	5	31	0	64
Physical capital	5	26	20	59
Cultivated land	7	22	2	37
Output	12	42	41	115
Wage	3	18	18	26
Rate of return	15	47	104	140
Nonagricultural sector (excluding government)				
Labor	2	-1	7	-8
Capital	5	20	33	50
Output	8	23	47	65
Wage	2	5	6	6
Rate of return	10	23	74	106
Government sector				
Labor	-4	-15	-24	-35
Wage	-5	-2	-11	6
Aggregated economy				
Labor	2	2	1	-3
Total capital	5	19	23	41
Output	8	24	40	63
Private consumption	10	27	46	70
Private investment	12	32	92	112
Exports	12	124	53	187
Imports	13	118	24	114
Wage	0	3	4	3

Figure 2.1--Crop yields, Argentina and the United States, 1913-84



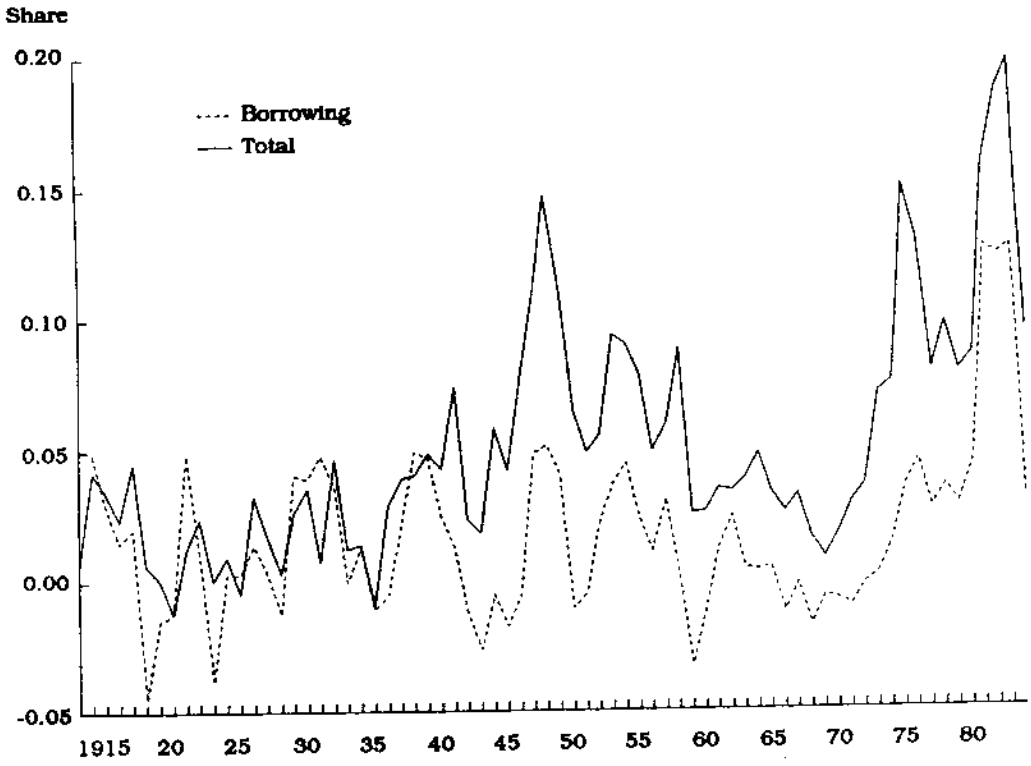
Source: MCD (1989)
Notes: This figure is based on a Divisia index of yields in 14 crops in Argentina and the United States. Base year 1913 = 100.

Figure 2.2--Government expenditures, 1913-84



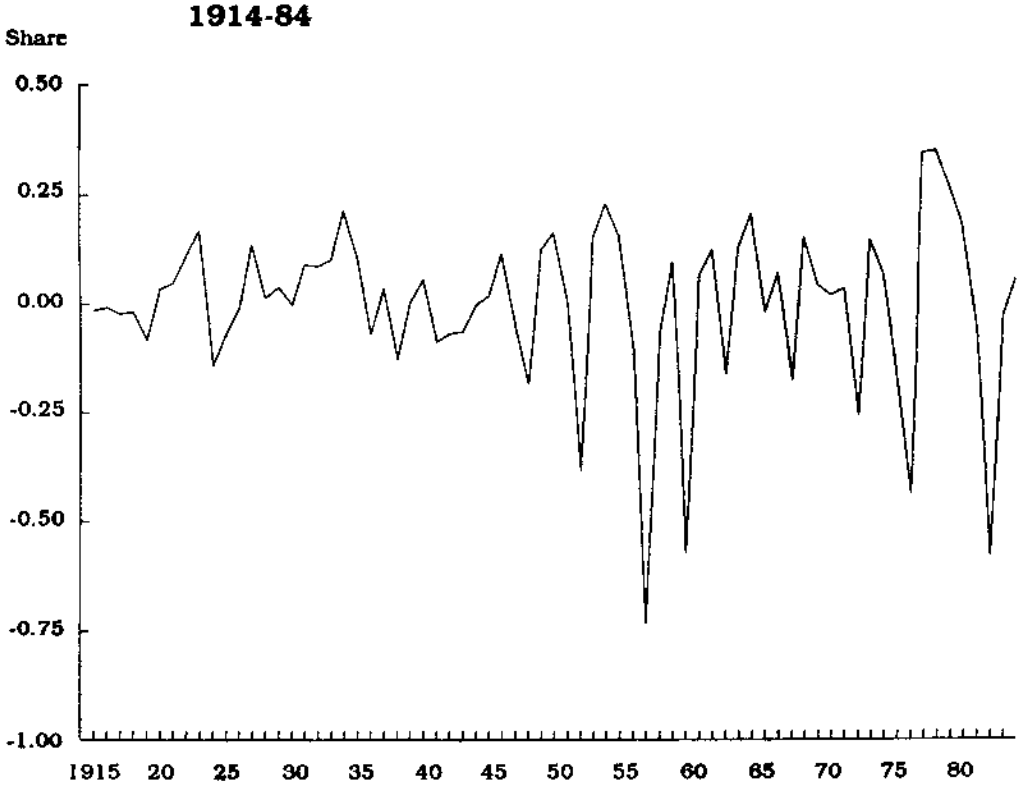
Source: MCD (1989)
Note: This is government consumption as a proportion of total income in current prices.

Figure 2.3--Fiscal deficit by source of financing, 1914-84



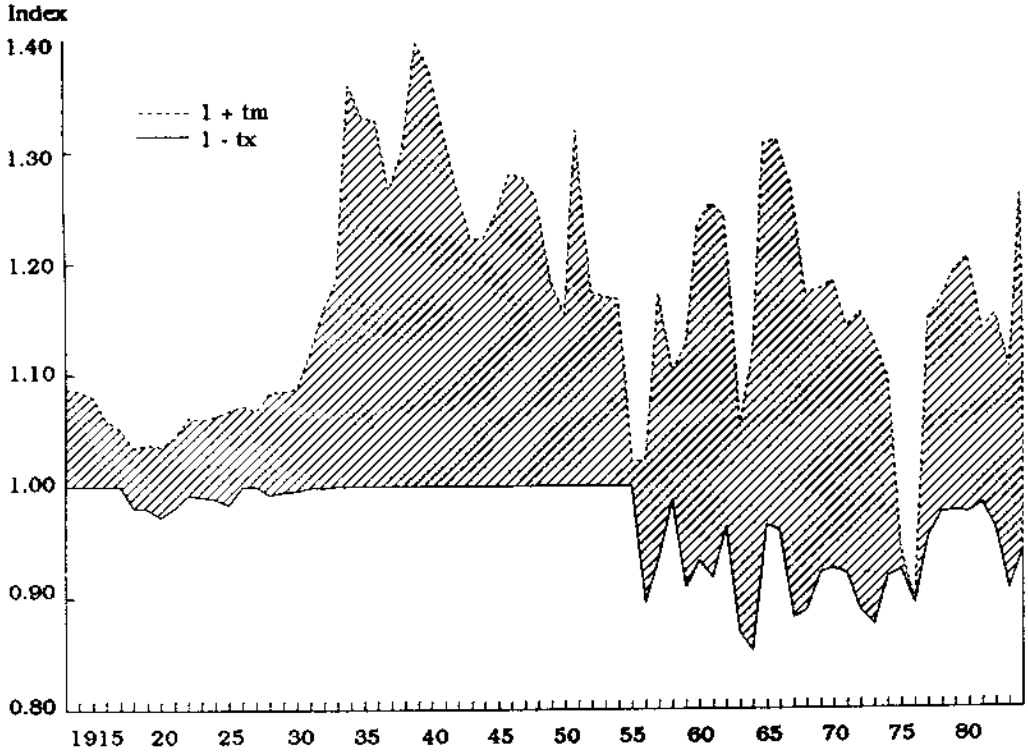
Source: MCD (1989)
Notes: This is the total fiscal deficit financed by borrowing and monetary expansion as a proportion of total income. Negative values are surpluses.

Figure 2.4--Indicator of monetary-exchange rate management, 1914-84



Source: MCD (1989).
Note: Computed as $\mu = \hat{M} - \hat{E} - \hat{P}^* - \hat{Y}$, where M is the M3 stock of money supply, E is the nominal exchange rate, P^* is the foreign price of Argentine imports and exports, Y is the real output, and the hat above each variable indicates the rate of growth.

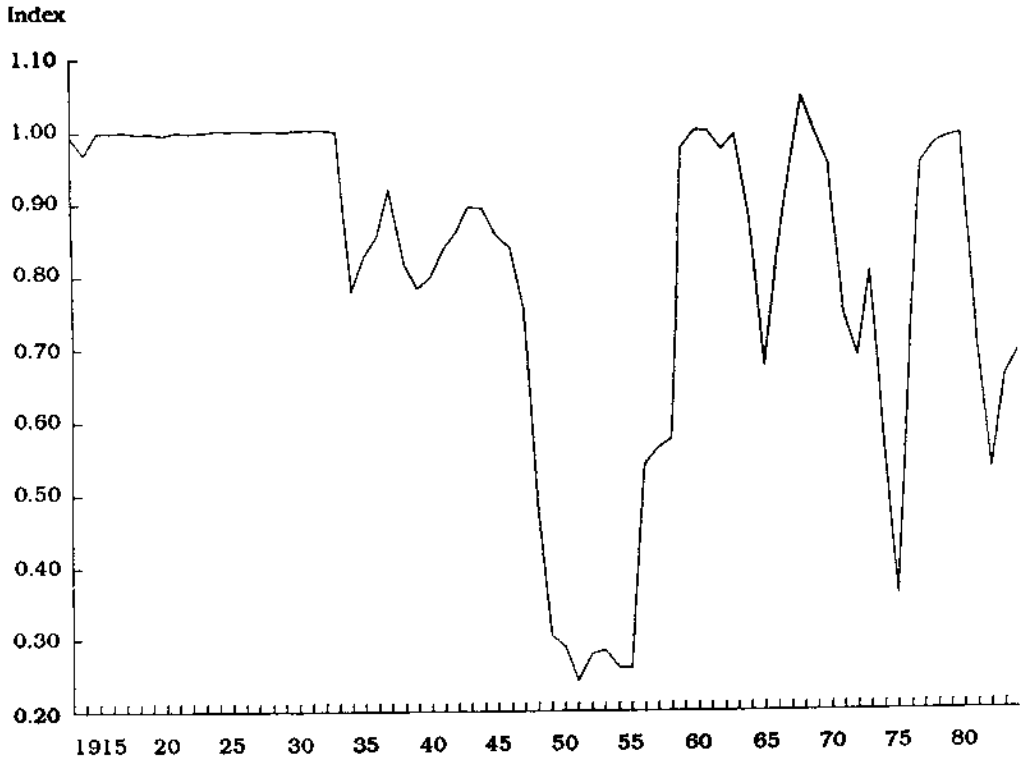
Figure 2.5--Trade policy, 1913-84



Source: MCD (1989).

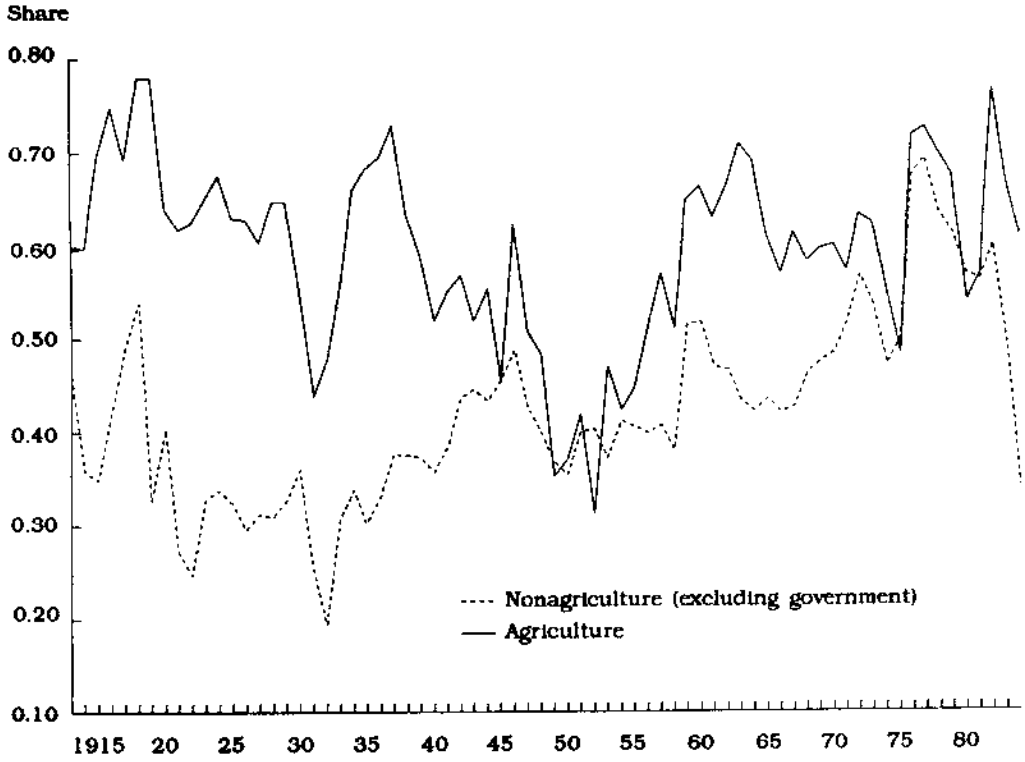
Note: The solid line is $1 - t_x$ and the broken line is $(1 + t_m)(E^m/E)$, where t_x is the proportion of taxes collected on exports over the value of exports, t_m is the proportion of taxes collected on imports over the value of imports, E^m is the nominal exchange rate for imports, and E is the nominal exchange rate for exports.

Figure 2.6--Degree of financial openness, 1913-84



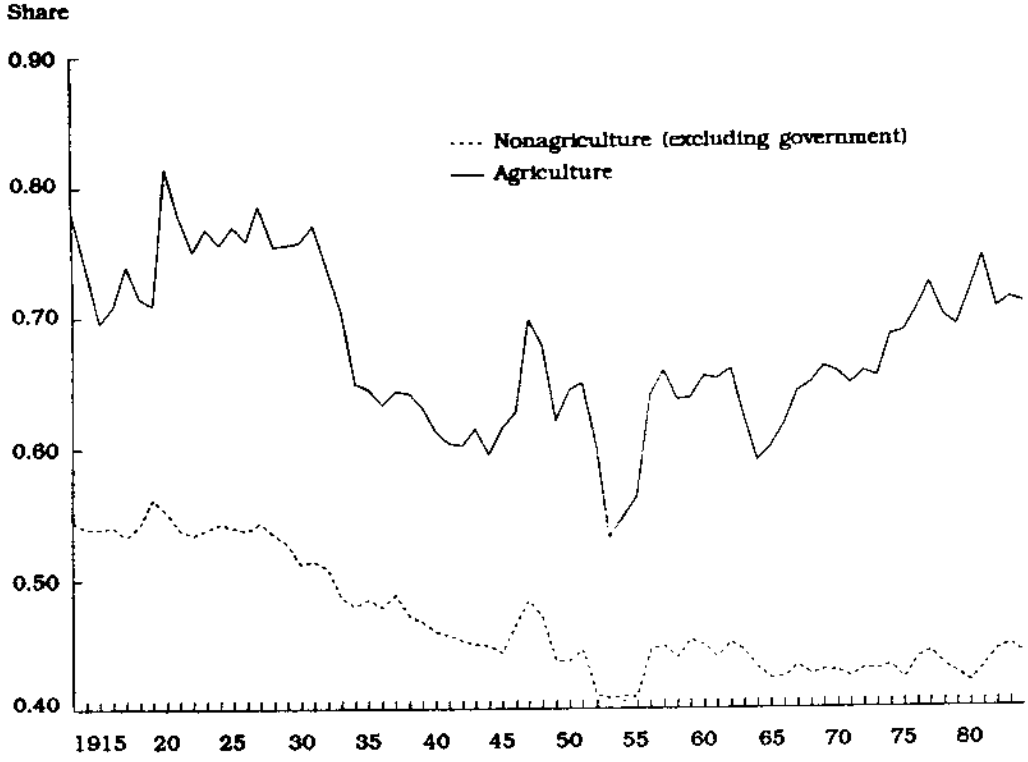
Source: MCD (1989).
Note: In rigor, this is the inverse of one plus the black market premium on foreign exchange, computed as E/E^b, where E is the official rate of exchange for exports and E^b is the rate of exchange in the black market.

Figure 2.7--Sectoral shares of capital, 1913-84



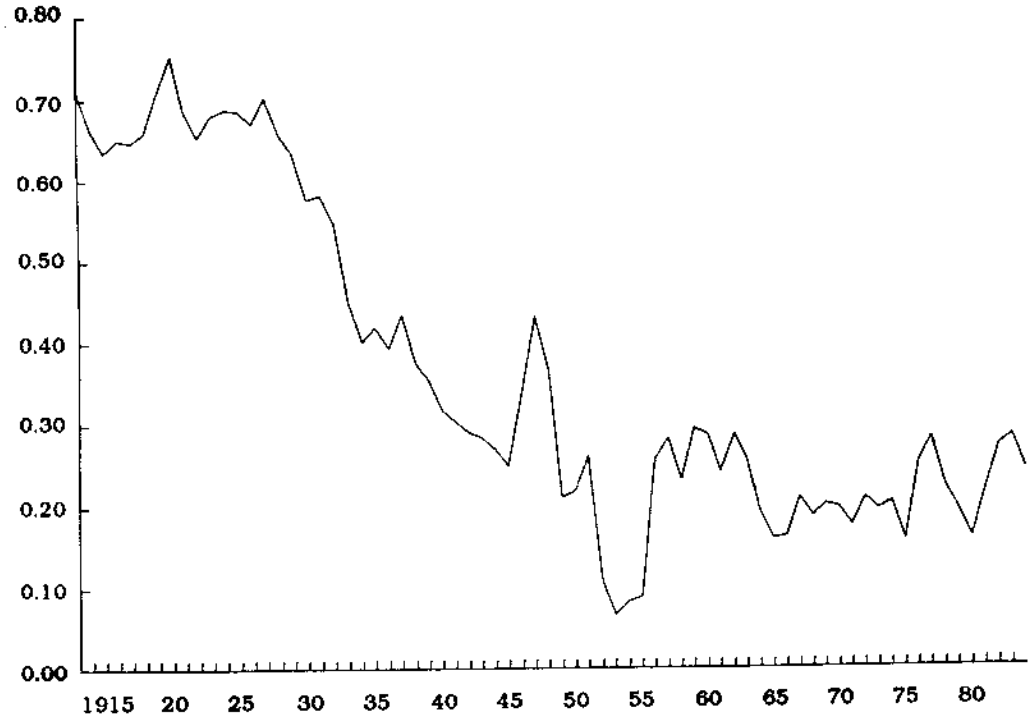
Source: MCD (1989)
Note: This is the share of income that accrues to capital in each sector, computed as one minus sectoral labor income.

Figure 2.8--Sectoral degree of tradability, 1913-84



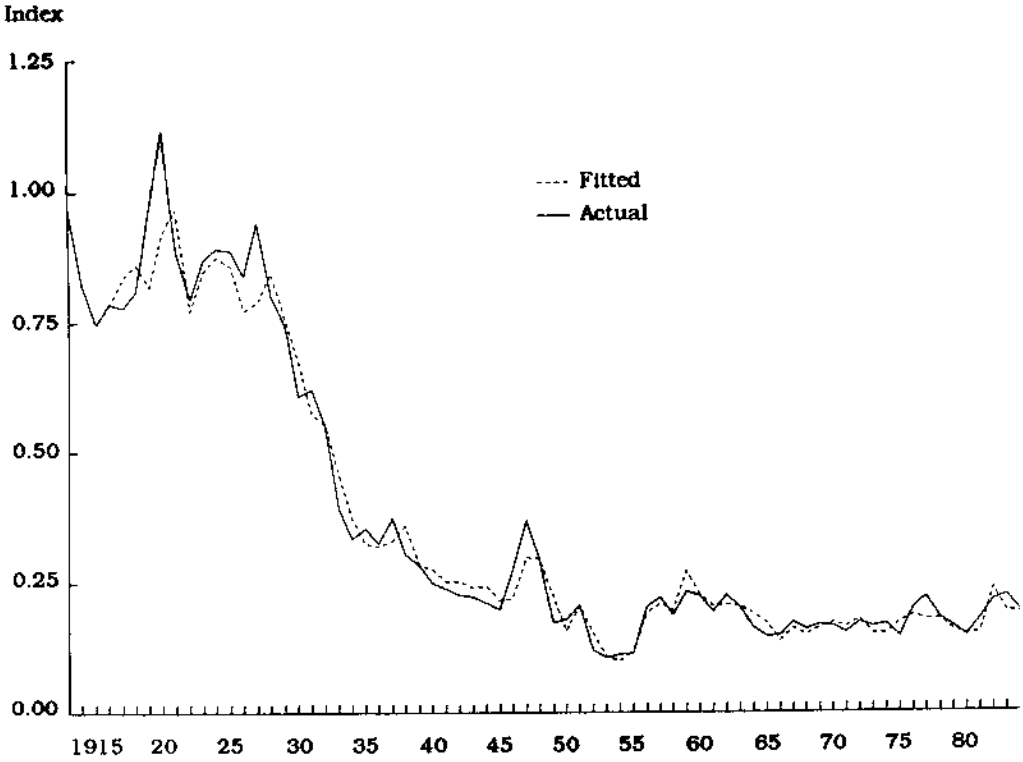
Source: MCD (1989)
Note: This is the traded share in sectoral output.

Figure 3.1--Elasticity of the real rate of exchange with respect to P_x/P_m (ω), 1913-84



Source: Computed from the estimated coefficient of $\hat{P}_x/\hat{P}_m$ in Table 3.1.

Figure 3.2--Actual and fitted values of the degree of commercial openness, 1913-84



Notes: This is the ratio of total trade to income.

Figure 3.3--Actual and fitted values of the real exchange for exports, 1913-84

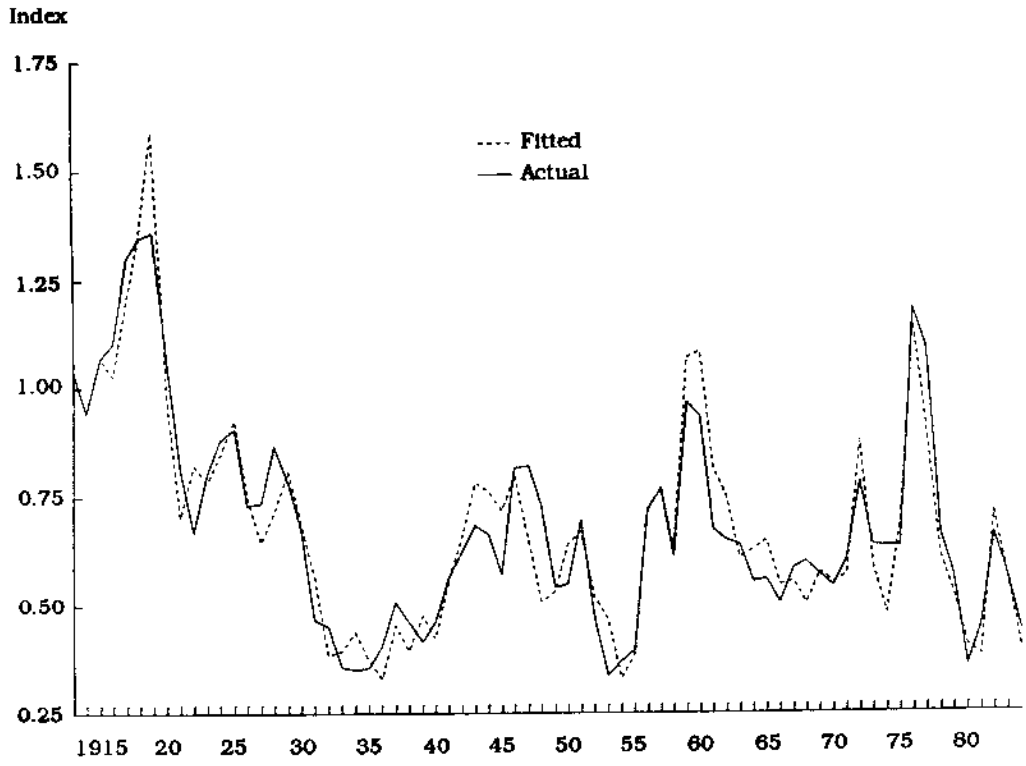


Figure 3.4--Actual and fitted values of the relative price of agriculture, 1913-84

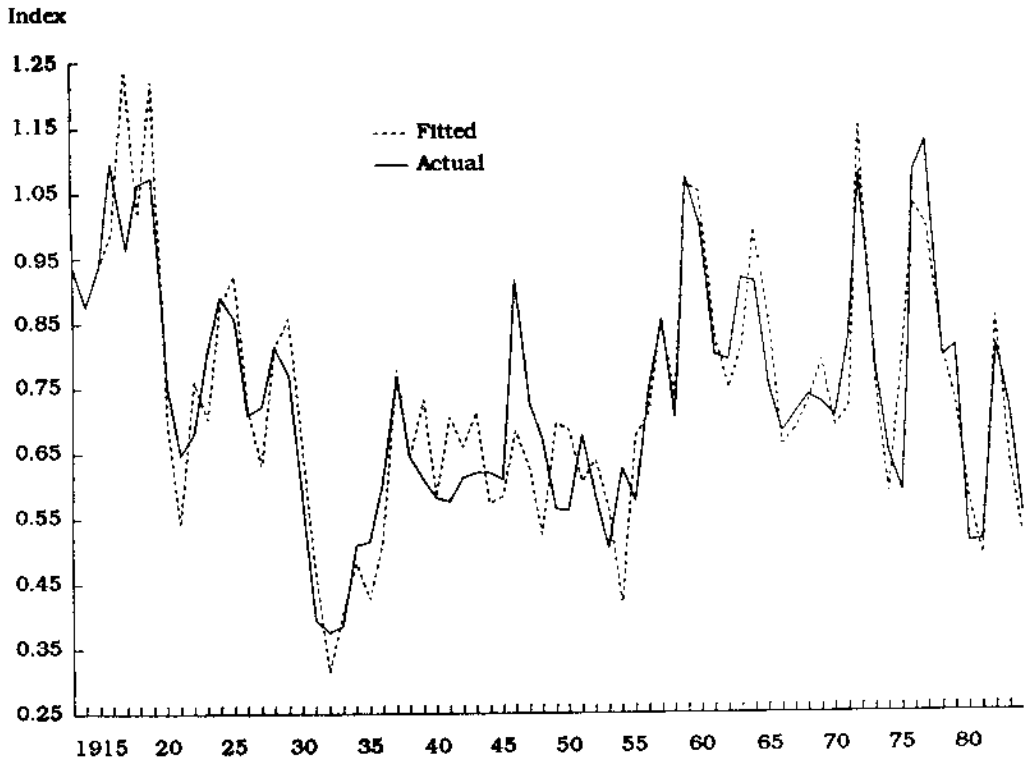


Figure 3.5--Actual and fitted values of the relative price of nonagriculture, 1913-84

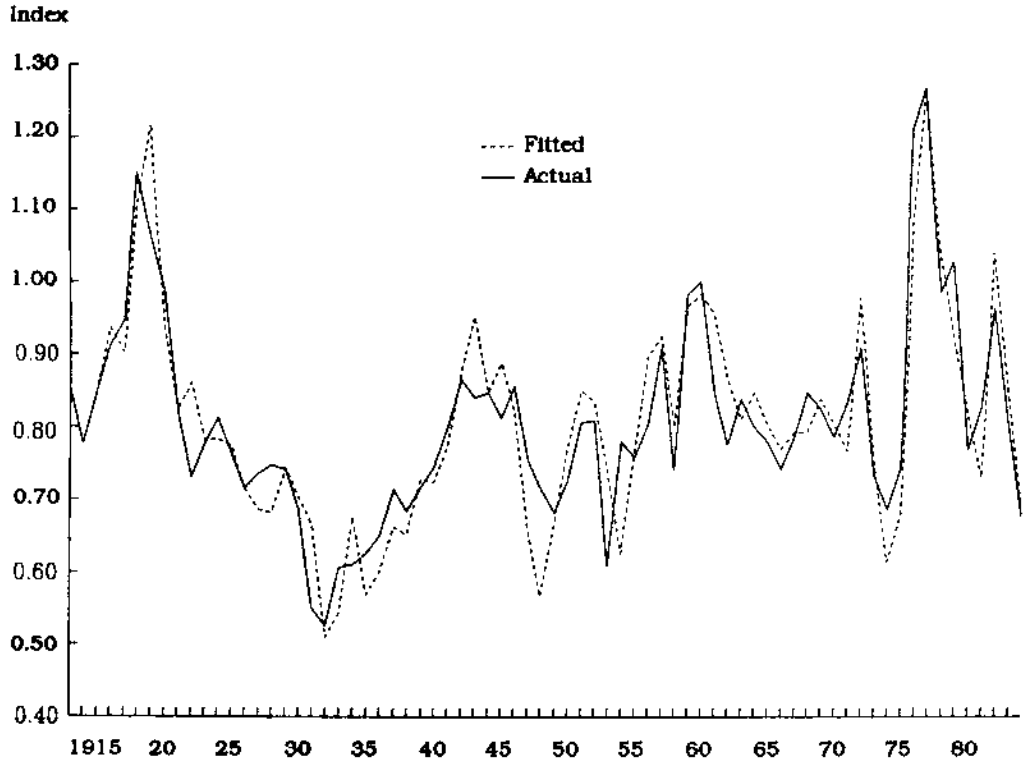
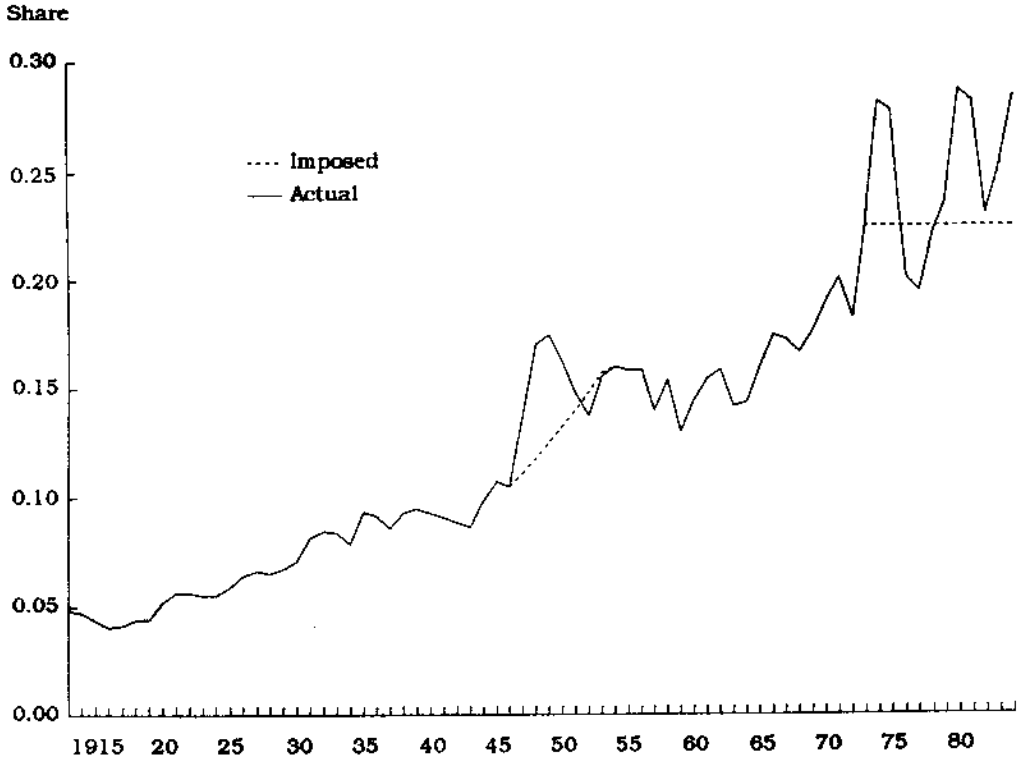
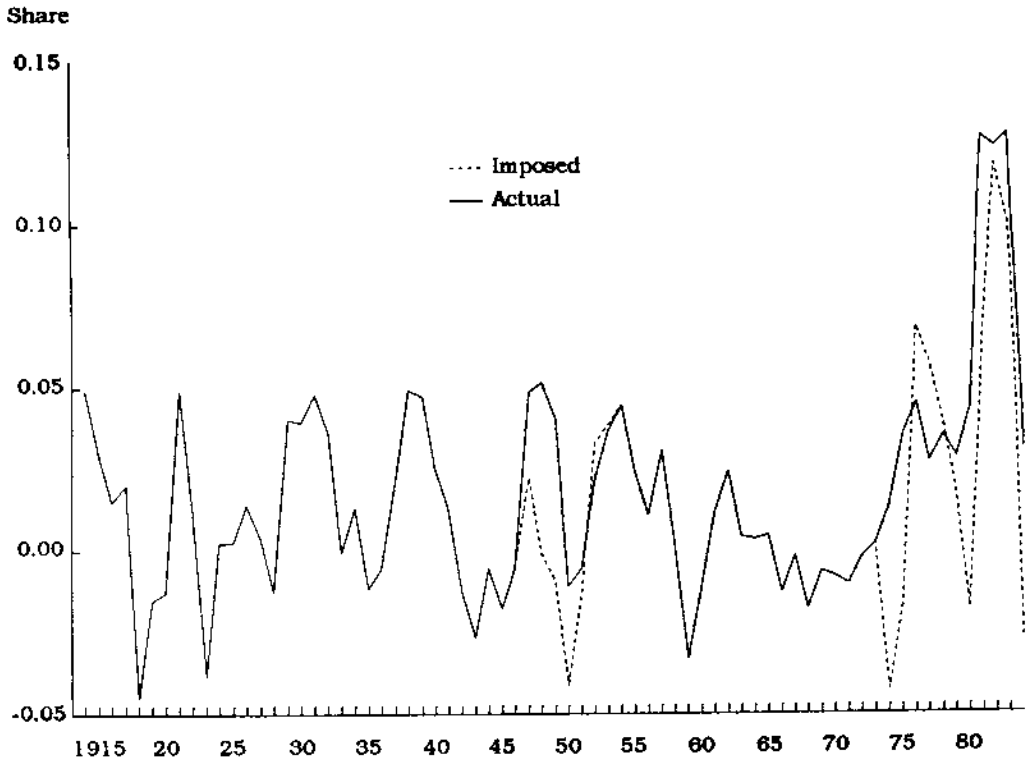


Figure 3.6--Actual and imposed values of government expenditures, 1913-84



Note: This is government consumption as a proportion of total income ($g = P_g C^g/PY$).

Figure 3.7--Actual and imposed values of debt-financed fiscal deficits, 1914-84



Note: This is the fiscal deficit financed by borrowing as a proportion of income ($f = F^b/PY$).

Figure 3.8--Simulated values for the degree of commercial openness, 1913-84

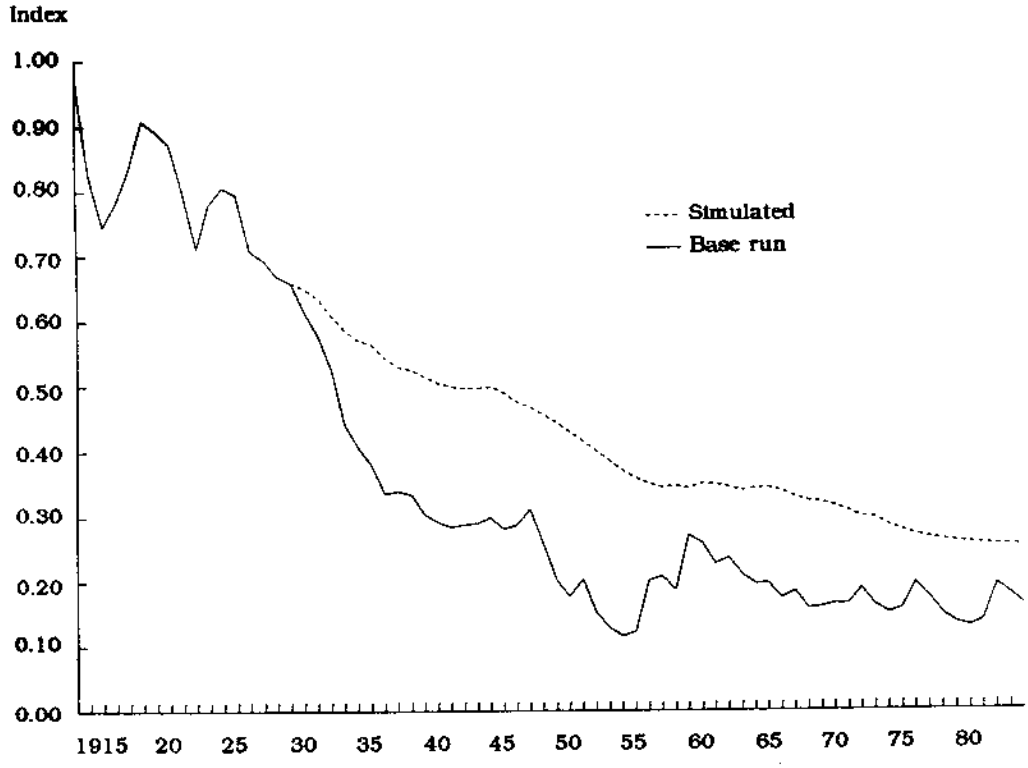


Figure 3.9--Simulated values for the real exchange rate, 1913-84

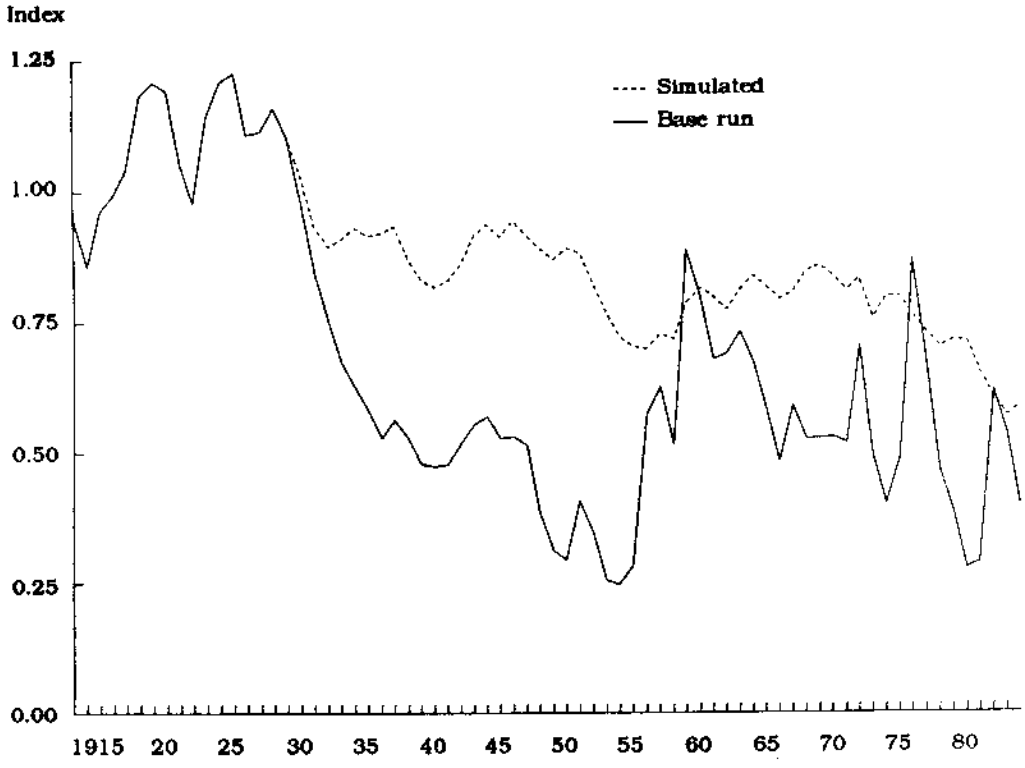


Figure 3.10--Simulated values for the relative price of agriculture, 1913-84

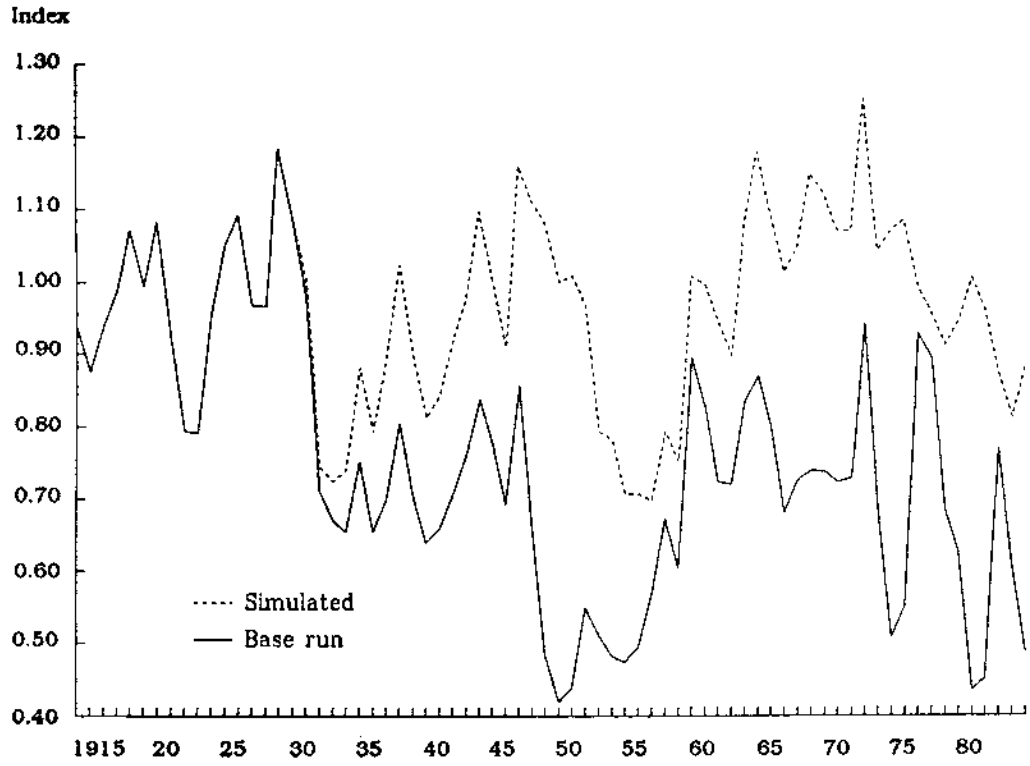


Figure 3.11--Simulated values for the relative price of nonagriculture, 1913-84

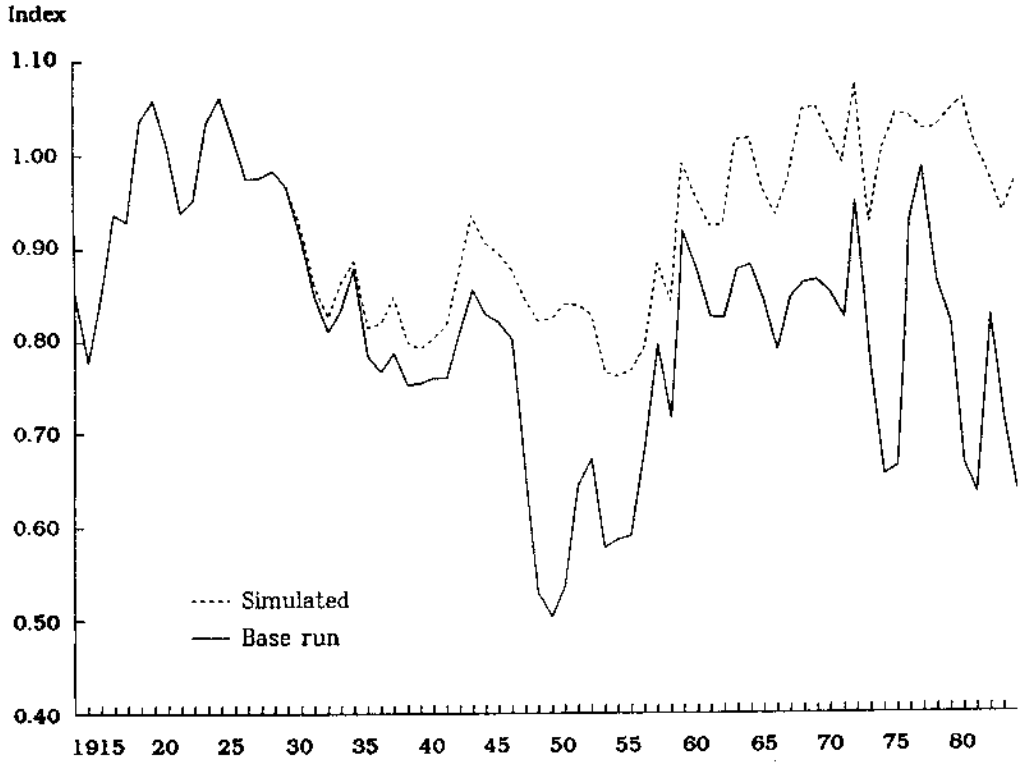
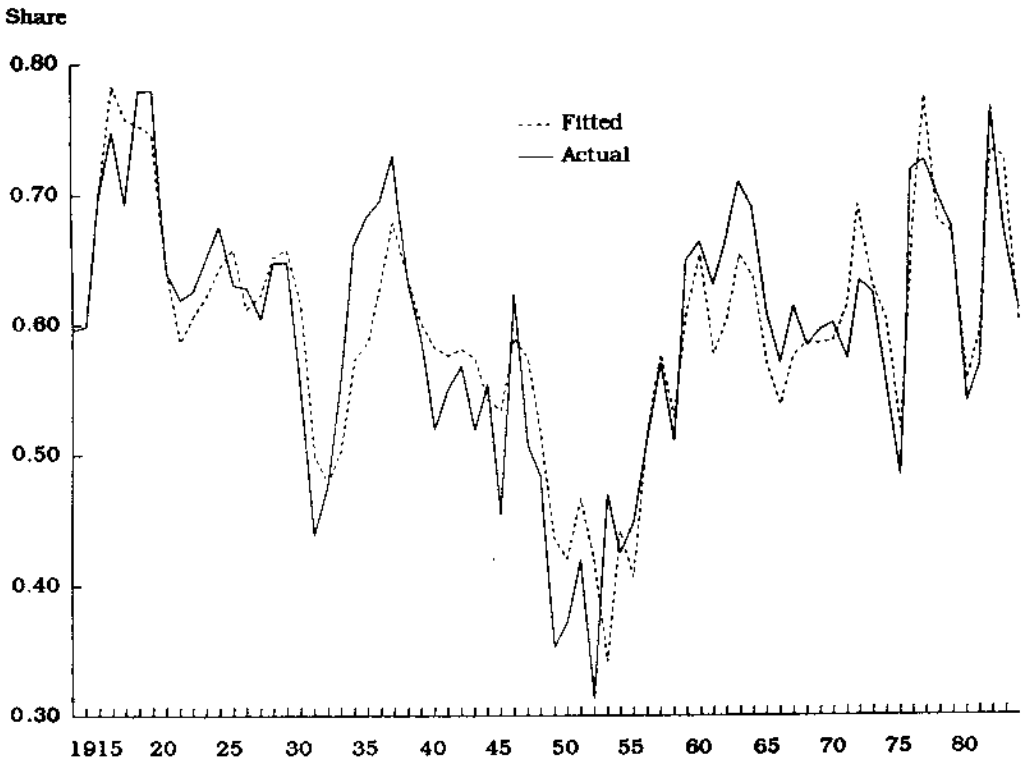
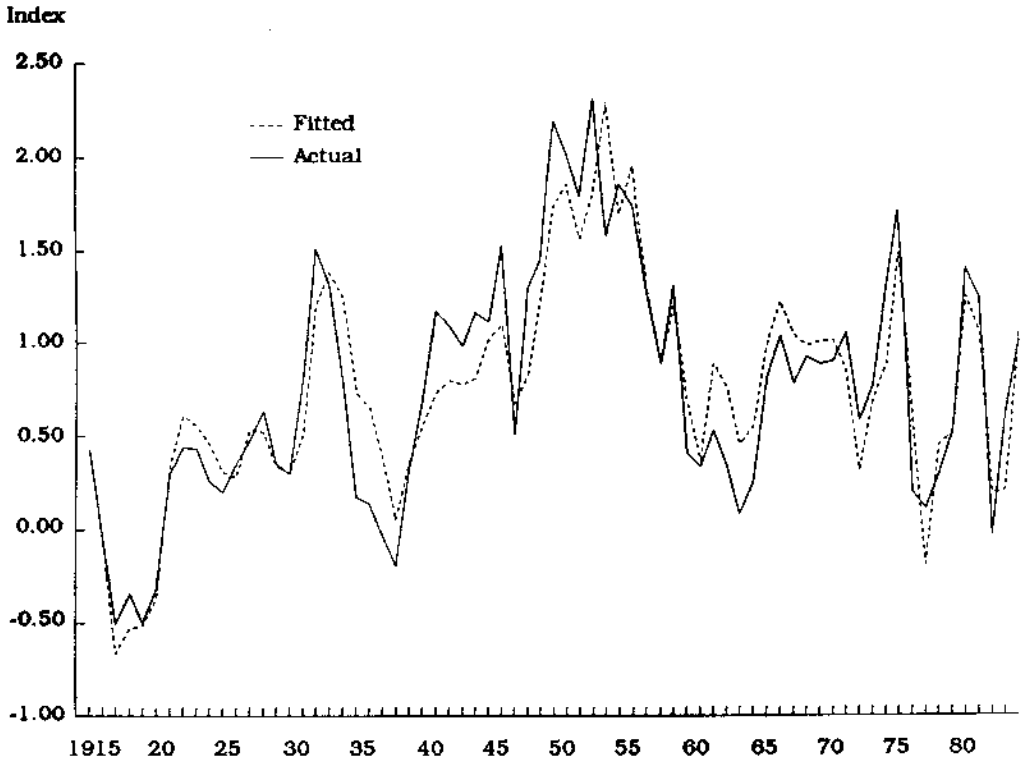


Figure 4.1--Actual and fitted values of capital shares in agriculture, 1913-84



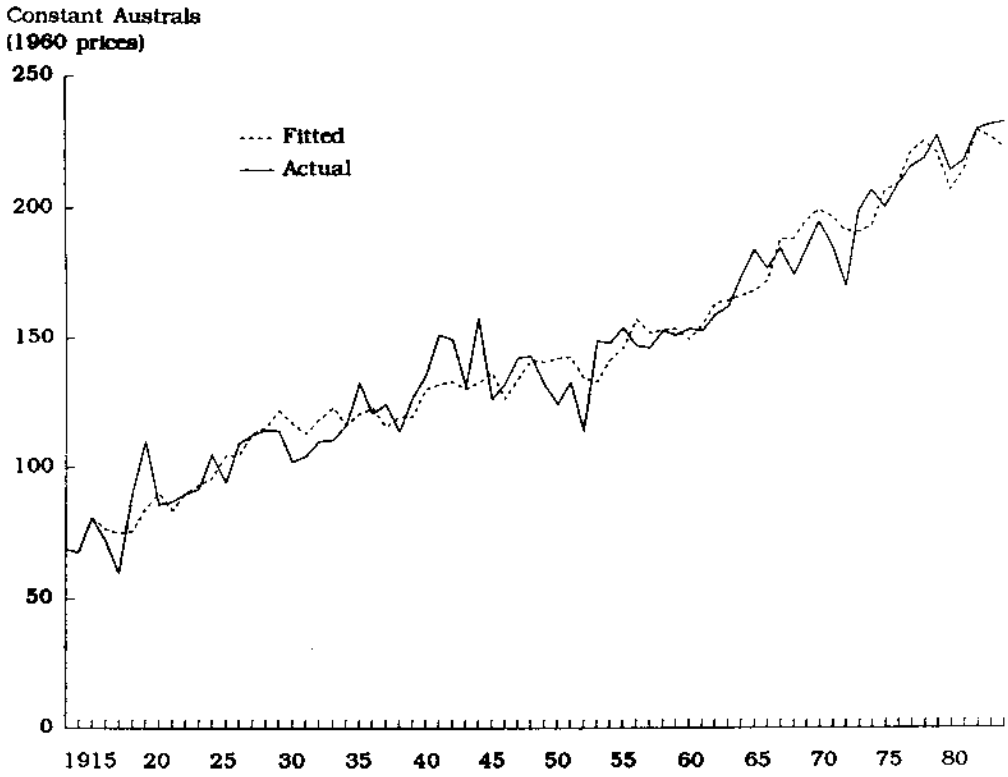
Note: Fitted values result from the regression for β_1 and Γ_1.

Figure 4.2--Actual and fitted values of the intercept of the production function in agriculture, 1913-84



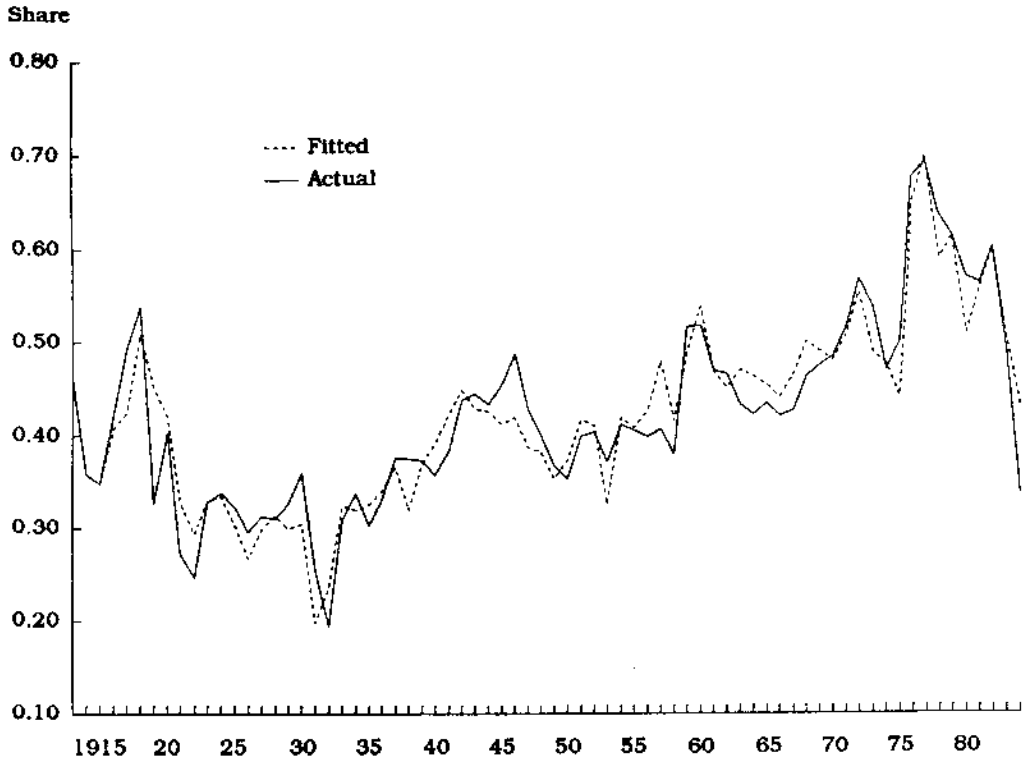
Note: Fitted values result from the regression for β_1 and Γ_1.

Figure 4.3--Actual and fitted values of agricultural output, 1913-84



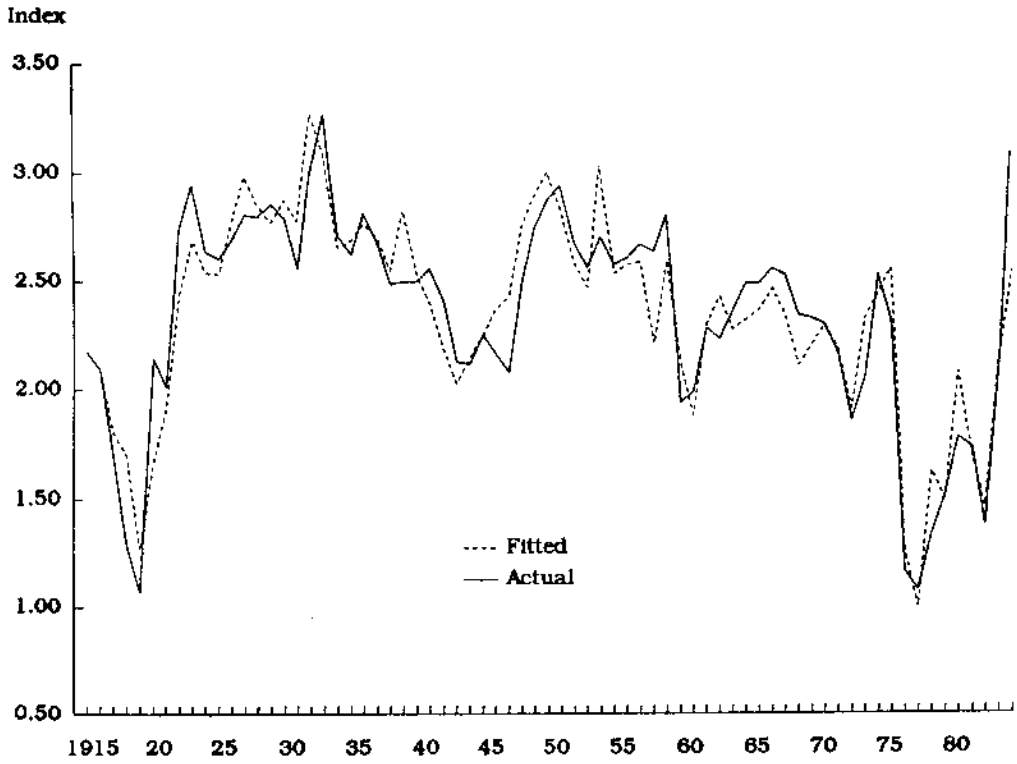
Note: Fitted values result from the regression for β_1 and Γ_1.

Figure 4.4--Actual and fitted values of capital shares in nonagriculture excluding government, 1913-84



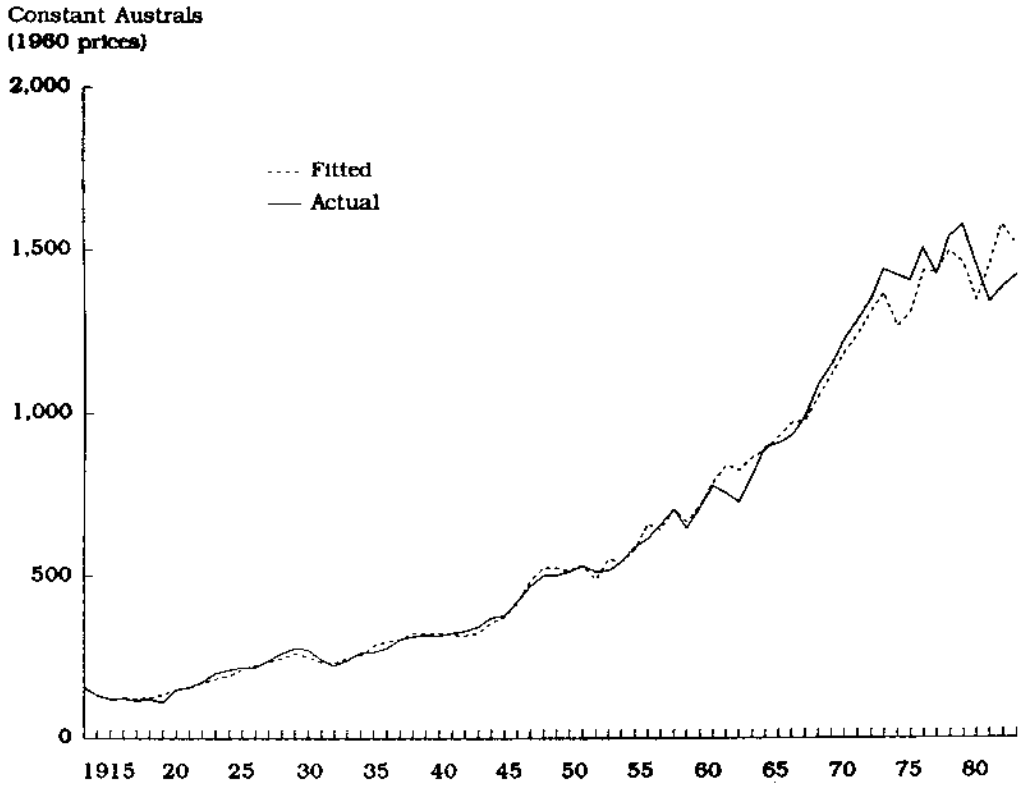
Note: Fitted values result from the regression for β_2 and Γ_2.

Figure 4.5--Actual and fitted values of the intercept of the production function in nonagriculture excluding government, 1913-84



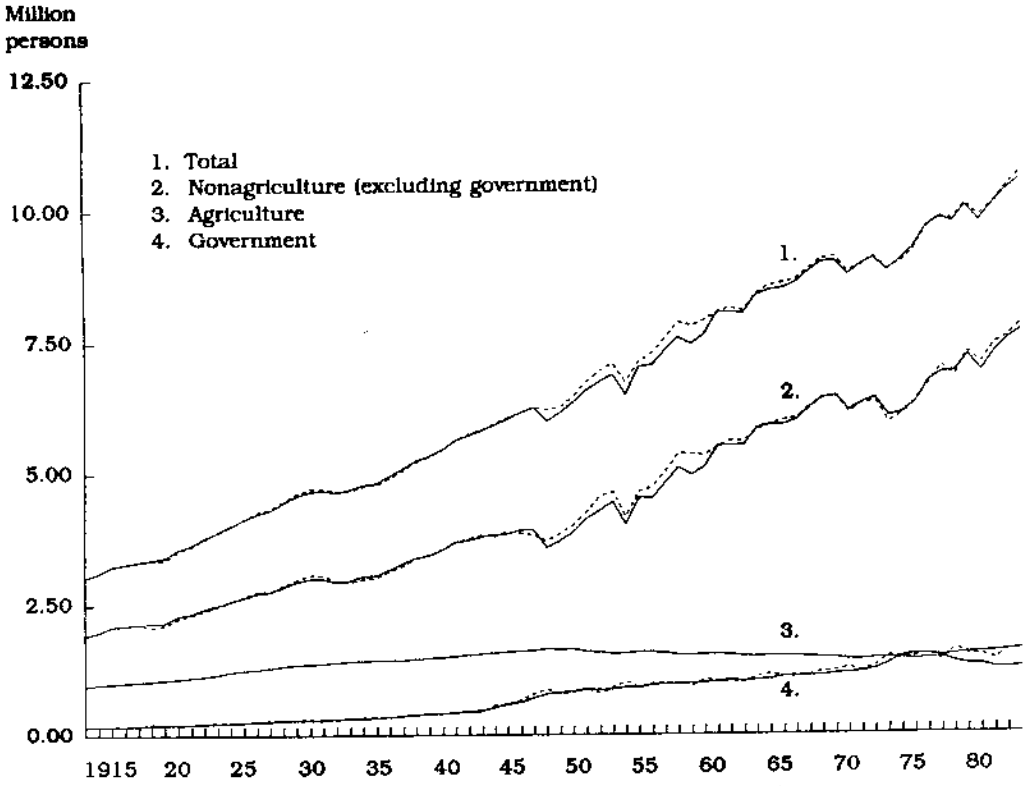
Note: Fitted values result from the regression for β_2 and Γ_2.

Figure 4.6--Actual and fitted values of nonagricultural output excluding government, 1913-84



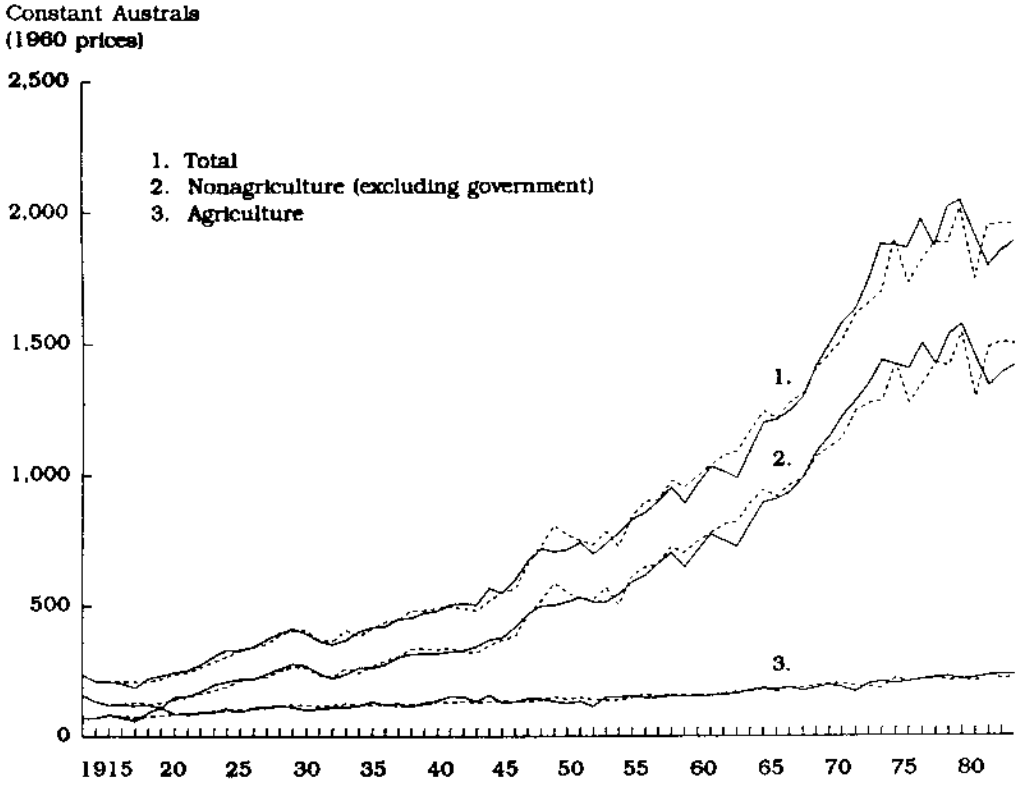
Note: Fitted values result from the regression for β_2 and Γ_2.

Figure 5.1--Actual and fitted values of employment and sectoral disaggregation, 1913-84



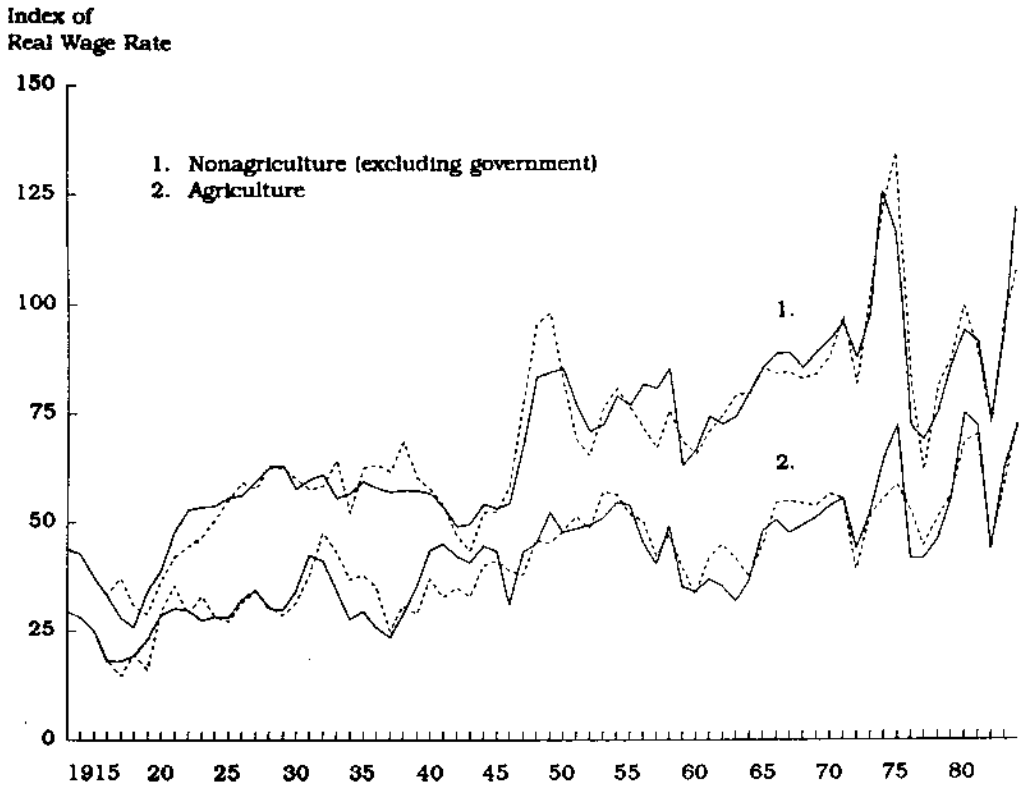
Note: Solid lines are actual values and broken lines are fitted values.

Figure 5.2--Actual and fitted values of output and sectoral disaggregation, 1913-84



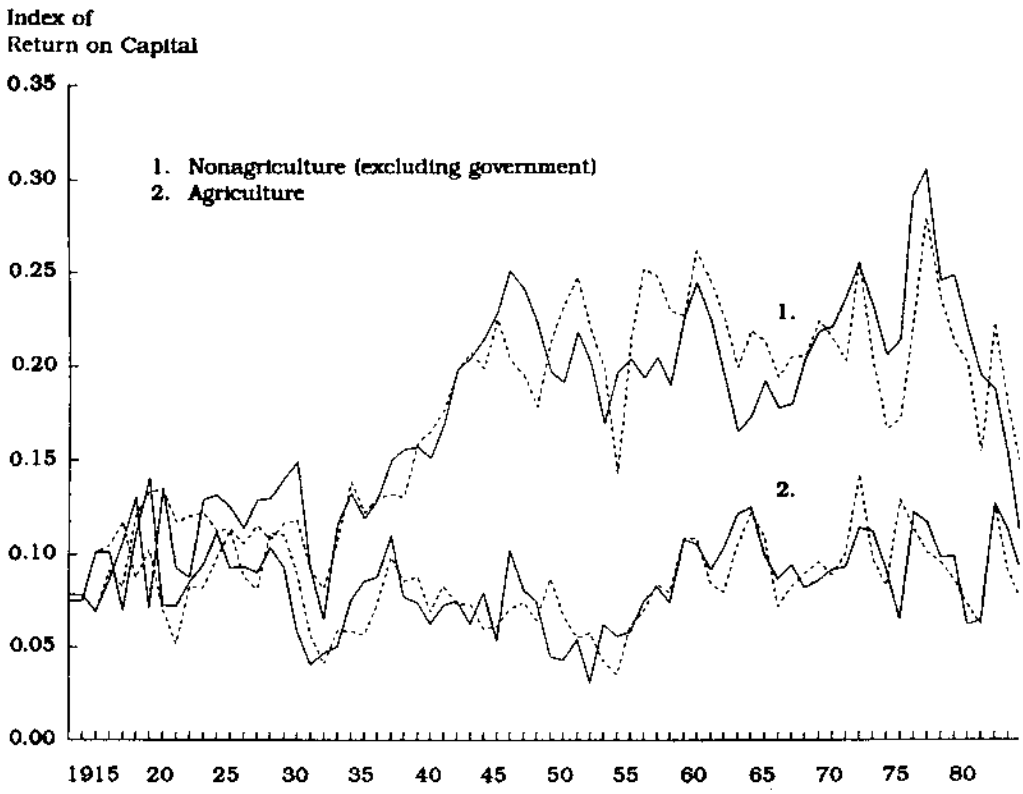
Note: Solid lines are actual values and broken lines are fitted values.

Figure 5.3--Actual and fitted values of sectoral wages, 1913-84



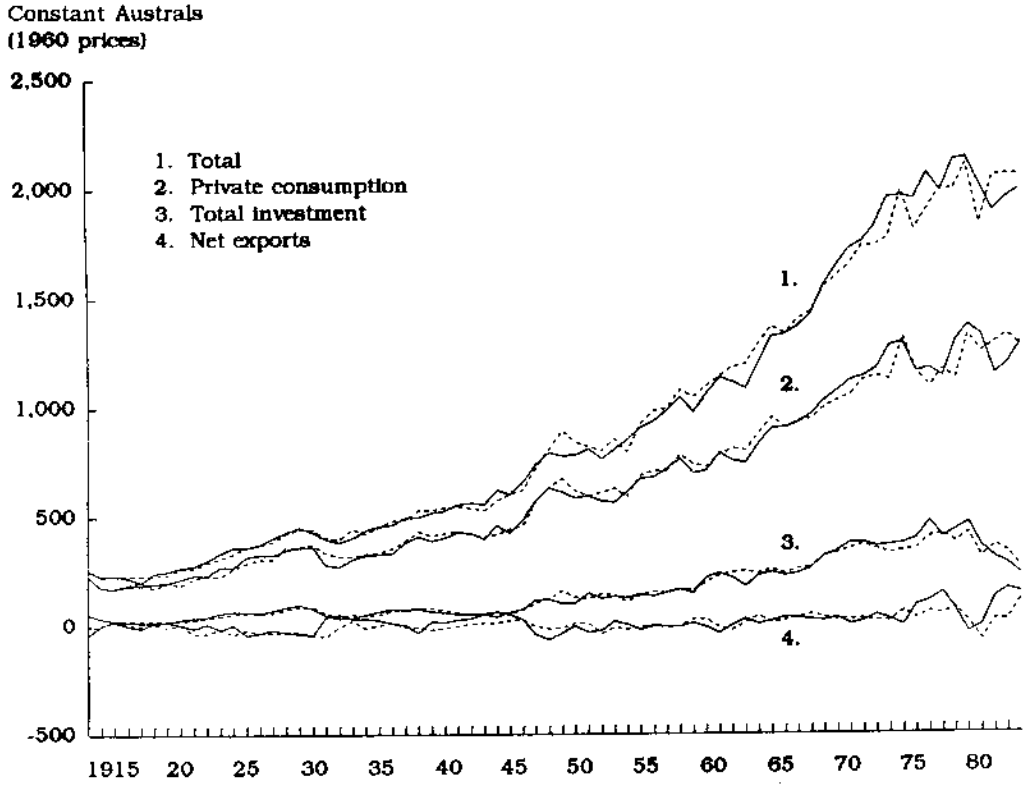
Note: These are nominal wages deflated by sectoral prices.

Figure 5.4--Actual and fitted values of sectoral rates of return, 1913-84



Note: Ratio of nonwage income to capital in each sector. Solid lines are actual values and broken lines are fitted values.

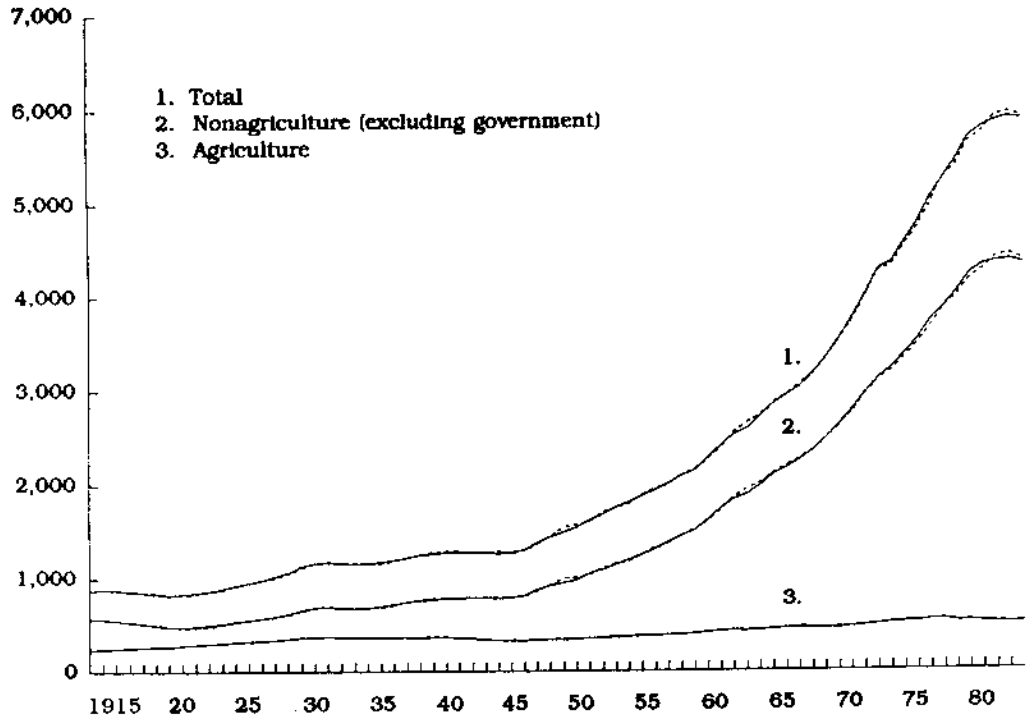
Figure 5.5--Actual and fitted values of total expenditures and their components, 1913-84



Note: Solid lines are actual values and broken lines are fitted values.

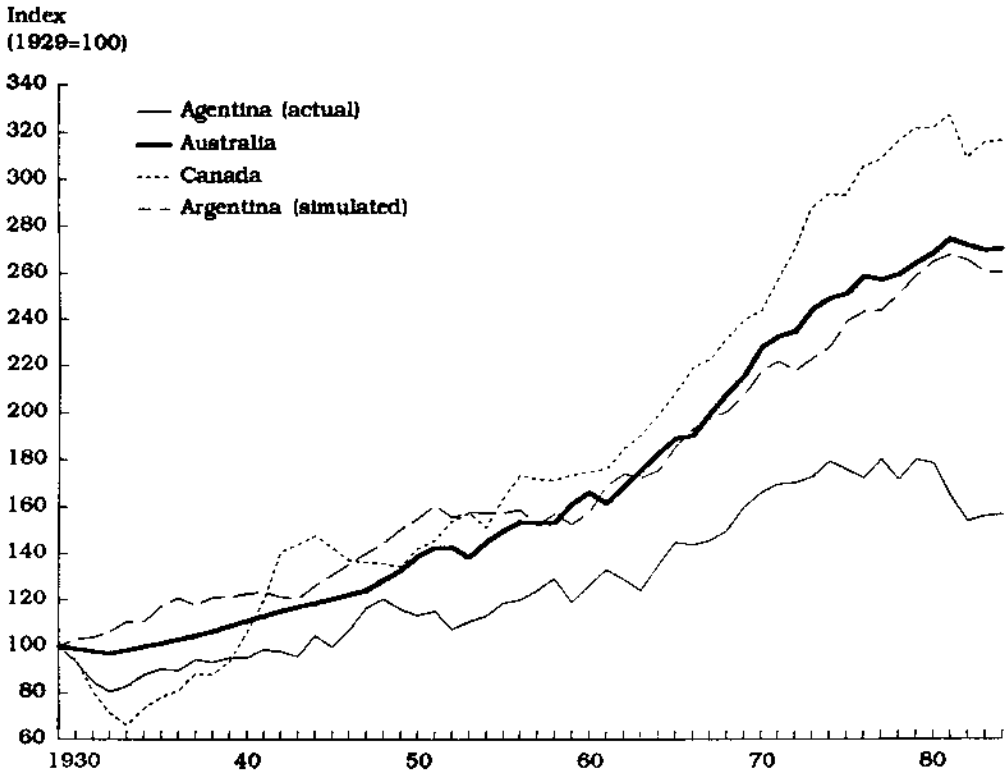
Figure 5.6--Actual and fitted values of the capital stock, and its sectoral compostion, 1913-84

Constant Australs
(1960 prices)



Notes: Solid lines are actual values and broken lines are fitted values. In this figure, actual and fitted values are virtually the same.

Figure 5.7--Growth trends in Argentina, Australia, and Canada, 1929-84



Source: MCD (1989).