A DISEQUILIBRIUM MACROECONOMIC MODEL OF THE MODIFIED CENTRALLY PLANNED ECONOMY: POLAND

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

David Michael Kemme, B.A., A.M.

* * * *

The Ohio State University
1980

Reading Committee:
Thomas A. Wolf
Edward J. Ray
Stephen A. McCafferty
Wilford L. L'Esperance

Approved By

Adviser
Department of Economics
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VITA

David M. Kemme
Age 29
Born November 12, 1950

EDUCATIONAL BACKGROUND

1973 . . . Bachelor of Arts, Mathematics
Miami University
Oxford, Ohio

1975 . . . Master of Arts, Economics
The Ohio State University
Columbus, Ohio

FIELDS OF SPECIALIZATION

Soviet and East European Economics (The Ohio State University)
International Economics (The Ohio State University)
Econometrics (The Ohio State University)

EMPLOYMENT, CONSULTING, INTERNSHIPS (1976-1980)

1976-1977: Graduate Teaching Associate, The Ohio State University
            Instructor, Otterbein College, Westerville, Ohio
            National Defense Foreign Language Fellow
            (Russian)

1977-1978: Teaching Associate, The Ohio State University
            National Defense Foreign Language Fellow
            (Russian)

1978-1979: Graduate Teaching Associate, The Ohio State University
            National Defense Foreign Language Fellow
            (Russian)
            Consultant: SRI-International, Center for
            Economic Policy Research, Arlington, Virginia
            Assistant Professor: University of North Carolina--Greensboro
1979-1980: Assistant Professor: University of North Carolina--Greensboro

PUBLICATIONS

Review of: "The Disequilibrium Model in a Controlled Economy" by David Howard. Forthcoming in the Southern Economic Journal

RESEARCH AND UNPUBLISHED WORKING PAPERS

"Industrial Cooperation and the Import of Technology as a Determinant of Economic Growth: Poland 1960-1975." August 1978

"A Preliminary Specification of an Econometric Model of Poland." April 1979
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Chapter 1: Introduction

In the past there has been little if any attention paid in the Western literature to the macroeconomic adjustment problems in centrally planned economies (CPEs) brought about by external disturbances. The primary reason for this lack of interest was the negligible level of East-West trade. However, because of (1) economic reforms in some CPEs calling for a more "direct link" between foreign and domestic trading activities, (2) relatively rapid expansion of East-West trade, and (3) the recent serious macroeconomic disturbances which have occurred in Western markets, there has been new attention focused on the macroeconomic adjustment processes of CPEs.

Before examining these processes we should highlight those features of a CPE which are quite different from a market type economy (MTE). ¹ In the traditional CPE the primary goal of the planners is a high rate of economic growth (in the past, much higher than in the MTEs), with emphasis on the industrial sector. The economy is sometimes described as a "command economy," a "pressure economy" and/or a "priority economy." Plans are drawn up based on the successive iterations of a vertical flow of information through the bureaucratic planning hierarchy. The final result, a
list of "material and capital balances," is a list of physical targets and a corresponding financial plan. It is the financial plan which serves as the planning authorities' direct control over individual sectors since it specifies certain levels of enterprise deposits and their use. The enterprise deposits are simply accounting entries on the books of each enterprise, and they can be converted to cash only for certain specified purposes. Thus the system of control established by the planners gives rise to two types of money: enterprise deposits and household cash. Only enterprise deposits are subject to the rigid control of the central authorities.

The final plan, embodied in the system of material balances, is usually described as "taut" since planners, striving to maximize economic growth, attempt to set output targets as high as possible and input targets as low as possible. This generally results in excess demand for factor inputs, especially labor. The plan specifies the prices, buyers and sellers of certain target levels of inputs and outputs. Any additional amount the enterprise desires may be bought on legal or quasi-legal markets at generally higher than planned prices.

The priority of planners has tended toward high rates of growth through extensive development of the industrial sector. As a result the producers goods sector is more tightly controlled than the consumer goods sector. In
general the consumer goods and agricultural sectors have tended to be neglected in most CPEs. The lack of investment in these sectors has resulted in general excess demand for consumer goods and a corresponding high level of forced savings and possible labor force withdrawal. In addition foreign trade is often used as an emergency "relief valve" for over-taut plans. Imported inputs were obtained to alleviate unforeseen shortages and exports were often goods in temporary surplus.

Thus the traditional CPE differs from the MTE in that, inter alia: (1) it has two types of money: enterprise deposits and household cash, (2) there is persistent excess demand for labor due to taut planning, (3) there is excess demand for consumer goods because of planners' emphasis on the industrial sector and neglect of the consumer goods sector, (4) there is a resulting high level of forced savings and possible labor force withdrawal, and (5) foreign trade plays a minor role in the economy.

In the past ten to fifteen years, however, nearly all East European countries have enacted economic reforms of various types. In two, Hungary and Poland, these reforms have been especially far-reaching. The "New Economic Mechanism" introduced in 1968 in Hungary and Gierek's "New Economic Maneuuvre" introduced in 1971 in Poland were significantly different from most other East European "reforms" of the 1960s. While several economists have maintained
"that foreign trade has left hardly a mark on the institutional structure of the Soviet economy [or] on its planning practice," the East European CPEs, lacking the tremendous resource base of the Soviet Union, are more dependent on foreign trade. Thus, "to a significant extent all of the recent economic reforms or proposed reforms in Eastern Europe have as a main purpose making the given socialist economy more effective as an earner of foreign exchange and as a gainer from the international division of labor." In Poland the principal goal of the 1971 reforms, as stated at the time, was to achieve "the greatest possible financial and organizational integration of foreign trade into the domestic economy, above all in the sphere of industry." As a result of the reforms in Hungary and Poland a "direct link" between world market and domestic prices was to be established for many (but not all) commodities. One question which of course arises is to what extent have the reforms actually been carried out and what effect has this direct link had?

In these modified CPEs (MCPEs) such as Hungary and Poland this direct link now appears to reduce the effectiveness of the conventional CPE's system for insulating itself from exogenous disturbances. The conventional CPE attempts to insulate the domestic economy from external disturbances, such as world inflation, through a system of price equalization (PE) subsidies and taxes. If we view all foreign trade of a CPE as being conducted by one monopoly trading organi-
zation called the ministry of foreign trade (MFT)⁵, then these PE subsidies or taxes are levied so as to exactly offset any profit or losses due to discrepancies between foreign and domestic prices. For example the MFT buys imports at world market prices (P*), making an expenditure in terms of the domestic currency equal to the price times the official exchange rate (R). It sells those imports to domestic enterprises at some given, fixed, domestic price (P_M). Thus the MFT may incur a profit (loss) on imports equal to Q_M(P_M − P_M*R), where Q_M is the quantity of imports.

A similar profit (loss) may occur for exports, and the MFT's net profit (loss) on price discrepancies then is offset by the PE tax (subsidy) paid to (from) the state budget. The end result is that domestic firms purchase the goods at the fixed domestic prices without regard to fluctuating world prices.

In a MCPE a direct link is established between world market and domestic prices for some goods. Central planning of production and trade may be eliminated for these goods as well. This of course forces domestic firms to take world prices into account and at the same time provides a more direct channel for the transmission of external disturbances to the domestic economy. Several questions arise: In a MCPE to what extent does price equalization still occur; is it effective? Are monetary and fiscal policies more or less effective in achieving domestic policy goals and does the
exchange rate now assume more importance than a simple accounting instrument?

Expanded trade between East and West, and the fact that East European countries have recently had ready access to Western credits makes an understanding of macroeconomic adjustments in the CPE or MCPE more elusive. The past constraint of balanced hard currency trade has been removed. The availability of Western credits has enabled East European countries to increase imports from the West to a significant degree. In some cases imports from the West of machinery and equipment and certain intermediate products have become a key part of their development strategy. This is particularly true in the case of Poland. Beginning in 1971, the Gierek regime's strategy called for a large increase in imports, especially of high quality and technologically advanced Western machinery. As a result of the planned deficit and world inflation Poland's total net hard currency debt rose from $800 million in 1970 to $10.2 billion in 1976. If we observe the PE subsidies in this period as well, in 1971 net PE taxes amounted to 0.88% of total state budget revenue. By 1975 net subsidies had reached 17.43% of the state budget.

Some have argued that this large subsidy to foreign trade organizations must now be placing an even larger burden on the state by reducing its ability to undertake other domestic programs, or that the increased subsidies per se are introducing inflationary pressures into the domestic economy.
Others argue that, in theory, the state can absorb these subsidies without difficulty by using fiscal and monetary policy coupled with appropriate financing methods, and that increases in subsidies per se do not constitute a burden but rather reflect underlying burdens which depend on a complex of factors. Closely related is the problem of financing these imports: at what point does Poland's hard currency indebtedness become a hindrance to further expansion of trade and stifle the Gierek development strategy?

Several economists have begun studying CPEs by applying Western analytical techniques. Others have maintained that Western analytical methods are simply not applicable to CPEs. The Soviet-type foreign trade systems have been analyzed, and it is generally accepted that because of their peculiar institutional characteristics, and the fact that they are centrally planned, many of the market mechanisms found in Western economies are largely inapplicable. For example, it is clear that the income adjustment mechanisms which result from a balance of payments (BOP) deficit, say, in a simple Keynesian model, are not applicable to the Soviet-type CPE. In the simple Keynesian model a decrease in exports will cause a decrease in income. This decrease in income will in turn decrease imports, which implies a partial reduction in the BOP deficit. With downwardly sticky prices the net decrease in income means unemployment, predominantly in export industries. In a CPE there are few direct income
effects because the production and distribution of real national product are determined within certain bounds by direct controls. There may, however, be multiplier effects depending on the reaction of the CPE authorities. For example, if imports are decreased in order to maintain balance of payments equilibrium and these imports are intermediate goods, bottlenecks may arise and further adjustments in succeeding stages of production must be made. In any event, CPE authorities are unlikely to permit any unemployment.

It has been emphasized so often that "the adjustment mechanisms of a market are of no use in explaining Soviet responses to changes in supply and demand conditions in foreign trade" that many seem to have been led to conclude that not only are Western mechanisms not applicable but that even though there are propensities and elasticities with respect to foreign trade in CPEs, the Western analytical apparatus needs or presupposes a market economy for its validity and therefore Western analytic techniques cannot be applied to the analysis of CPEs. This however is not true, for it is precisely Western analytics which can be used to demonstrate that Western mechanisms are not effective in CPEs. Western analytic methods have been used in the examination of price equalization subsidies and BOP adjustment in the form of the elasticity, absorption and monetary approaches to BOP adjustment. All three approaches
are distinctively "Western," but in their definitional form are independent of the economic system. Thus the approach or analytical techniques of Western economists, despite earlier criticisms, appear quite useful and are gradually becoming more acceptable in the analysis of CPEs.

This study is one concerning questions of macroadjustment in a MCPE. It is a more specific study than those mentioned above.\textsuperscript{15} Using tools common to Western economic analysis (modern BOP adjustment theory and disequilibrium models\textsuperscript{16}) and explicitly acknowledging the specific features of the MCPE, I examine the question of adjustment and response to exogenous disturbances by the authorities and by domestic markets in a particular MCPE, Poland. Exogenous variables may be "external" (such as changes in world market prices) "internal" (e.g. a change in consumer demand due to changes in tastes) and "policy exogenous" variables such as production targets, government expenditures and tax rates. The primary focus of this study is on the impact of "external" disturbances, changes in world market prices, and "policy exogenous" variables such as changes in tax rates.

The disequilibrium aspects are important because it is commonly believed that in a CPE such as Poland, a state of disequilibrium in the labor market and/or the consumer goods market may persist indefinitely. Continuing excess demand for consumer goods may cause indirect disincentive effects on the labor supply. In addition, an increase in prices in the
domestic consumer goods market, sufficient to restore equilibrium, may be politically unacceptable. These are certainly not the only effects of persistent disequilibrium. This disequilibrium nature of the CPE is examined more carefully in Chapters 3, 5 and 6. Chapter 2 presents a brief economic history of Poland to acquaint the reader with the Polish economy. Then, following a brief discussion of the origins of the analysis of foreign trade adjustment mechanisms in CPEs in Chapter 3, a model of the hypothetical MCPE is developed. Chapter 4 develops a closed economy equilibrium model. The optimality conditions for the hypothetical enterprise and household in a MCPE are derived and compared to those of the profit maximizing firm in a market type economy. In addition, the impact of changes in policy variables such as taxes on households and the relative weight planners assign to the components of the objective function enterprises are required to maximize, is analyzed.

Chapter 5 continues the discussion of the closed MCPE model and introduces the disequilibrium aspects through the adaptation of the Barro-Grossman non-market clearing paradigm of the market economy. Here "effective" demand and supply functions are developed. It is shown that the hypothetical MCPE will reach equilibrium levels of output and employment which are less than the levels in the market clearing case but greater than that for the CPE. Further, even if only one market does not clear, say one of the consumer goods markets,
the persistent excess demand for this commodity will cause a
decrease in the labor supply (a divergence between the effect-
tive and notional supplies of labor) which results in a lower
level of output and employment.

In Chapter 6 the hypothetical MCPE model is opened to
foreign trade. This allows all domestic markets to clear
even if some prices are fixed, as long as there are no trade
controls. The impact of changes in the world market prices
of several categories of goods are examined. The resulting
changes in the foreign currency, domestic currency, and
devisa balance of payments as well as the change in price
equalization profits (losses) and the government's budget
surplus (deficit), are derived. Several policy alternatives,
ranging from the simple sterilization of an inflow of foreign
currency; to changes in taxes and government subsidies are
considered. The last policy alternative, trade controls on
some goods, is considered also. This policy is shown to lead
to domestic disequilibrium, and the effective supply and
demand functions discussed in Chapter 5 prevail. In this
situation exogenous increases in world prices may actually
lead to a deterioration in the balance of trade which is
greater than the case without controls. However the
fluctuation in price equalization profits (losses) and
resulting taxes (subsidies) will be less.

In Chapter 7 several of the simplifying assumptions
made in the development of the model are discussed in terms
of their implications for empirical analysis. The causal flow within the model is discussed briefly and modifications in the specification are suggested for purposes of empirical estimation. The data problems involved with attempting to estimate the model are also discussed. A brief summary of the major findings of the model is presented along with suggestions for future research and extensions of the model.
Notes to Chapter 1

(1) A detailed description of a CPE may be found in the appendix of Brown and Neuberger [37]. In general we are speaking of the USSR, GDR, Poland, Hungary, Rumania, Bulgaria and Czechoslovakia.

(2) Levine [134].

(3) Grossman [87], p. 341.

(4) Machowski [138].

(5) This is a reasonable simplification since most foreign trade is conducted by noncompeting state trade organizations.

(6) For 1971 imports were 16,421 million zloty, rising to 29,480 million in 1975 (constant prices). See Fallenbuehl, et al., [67] for further details.

(7) See Zoeter [245] for details.

(8) For further details see Fallenbuehl, et al. [67].

(9) Fallenbuehl [64] and others continue to maintain the PE subsidies per se are a burden. Wolf [232] argues the subsidies can easily be offset, in theory. This problem is discussed more extensively in Chapter 3.

(10) See Holzman [101], [103].

(11) Holzman [101], [103] examines the Soviet adjustment processes in this manner by applying Western analytical models to the Soviet CPE. His conclusion is that
Western adjustment mechanisms are not, in general, applicable but that Western modes of analysis are.

(12) Berliner [20].

(13) See Grossman [87] for an argument along these lines.

(14) See Wolf [241] for a detailed treatment of this and other topics. Brada [27], [29] and Portes [171], [172] also use Western analytics in the form of disequilibrium macroeconomic models to examine BOP adjustments and repressed inflation in CPEs respectively.

(15) More specific than Brada [27], [29], Portes [171], [172], Wolf [241] or Holzman [103] since they are concerned with a general conventional CPE or MCPE. This develops a model of an MCPE based on the institutional characteristics of Poland, in much more detail.

(16) The development of disequilibrium analysis is briefly surveyed in Chapter 3.
Chapter 2: A Brief Economic History of Poland

This chapter presents a brief postwar economic history of Poland. The major aggregates which are officially reported shall be examined, and the economic reforms which took place shall be discussed. The emphasis will be on recent economic performance, from 1960 to the present (the second through fourth five year plans (FYPs)). The earlier period, from 1947 to 1959 (the three year plan, the six year plan and the first five year plan) will be discussed, but in less detail as data are often less reliable and incomplete. Data are compiled in the tables of Appendix A and replicated in the text where necessary.

The Polish economy, devastated during World War II, underwent a period of reconstruction until 1949. The three-year plan for 1947 to 1949 was more a forecast of production, given the existing capacities, than an actual plan. Little effort was made to change the structure of the economy or modernize it. The primary goals were to increase the standard of living above the pre-war level and strengthen state control. In these aspects it was successful. Despite persistent shortages, high rates of inflation and wage payments made in kind or in commodity allotments, national income\(^1\) in 1949 was 28% larger than the 1938 level and 59% larger than the 1946 level.\(^2,3\)

15
This was achieved through three measures: (1) nationalization of most industry, enabled the direct transfer of resources to key branches of production to take place and brought about a more rapid start up of production in those branches, (2) realignment of the Polish borders brought Western territories from Germany which had a more technologically advanced industrial base and agricultural territory with a highly developed infrastructure, in exchange for less developed agricultural territory ceded to the Soviet Union, and (3) extensive use of resources: increasing employment and utilizing industrial capacity which was idle during the interwar period.

The six-year plan from 1950 to 1955 assumed an imperative or command nature which the three year plan did not. At this time national plans were drawn up using material balances and balances of equipment and plant capacities. These estimates were made in physical units while prices were used to aggregate the physical output of individual firms, to compute the total investment budget, and to divide output between consumption and "accumulation". The central planning board used prices only to facilitate control of enterprise management. Prices did not necessarily reflect relative scarcities. The plan itself appeared overly optimistic and only in one area, the growth of industrial output, were planned aggregate targets achieved, as Table 1 indicates.
The evaluation of the plan and its results is difficult for several reasons: (1) plan targets often changed, or were extremely vague, (2) new products were often introduced, and (3) prices used in calculations had little or no meaning, as a result the actual growth rates presented can serve only as rough indicators of performance for purposes of comparison.

Not only did prices cause difficulty in evaluating plan fulfillment but they were also the source of many allocation problems. By early 1953 Polish economists began to realize the potential of prices as a means of influencing the production decisions of enterprises and improving the allocation of investment goods. The economy was undergoing a rapid rate of industrialization, and economic growth was quite high as a result of the classical, "Stalinist", extensive development strategy which emphasized rapid rates of growth of factor inputs. However, the glaring inefficiency of Polish firms

<table>
<thead>
<tr>
<th></th>
<th>Plan</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Growth of National Income 1949 to 1955</td>
<td>112%</td>
<td>75</td>
</tr>
<tr>
<td>Rate of Growth of Investment 1949 to 1955</td>
<td>140</td>
<td>162</td>
</tr>
<tr>
<td>Rate of Growth of Employment 1949 to 1955</td>
<td>60</td>
<td>56</td>
</tr>
<tr>
<td>Rate of Growth of Real Wages</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>Rate of Growth of Per Capita Consumption</td>
<td>50-60</td>
<td>30-44</td>
</tr>
<tr>
<td>Rate of Growth of Industrial Output</td>
<td>158</td>
<td>170</td>
</tr>
<tr>
<td>Rate of Growth of Agricultural Input</td>
<td>50</td>
<td>13</td>
</tr>
</tbody>
</table>

Source Zielinski[242] p. 4.
at the microeconomic level and the misallocation of investment resources brought about the discussion of economic reforms. The earliest reforms, of January 1953, set the basis of price formation upon average cost of production and the legal decree of December 9, 1953 set up the legal framework for the 1956 reforms.

The discussion of economic reform was intense from 1955 to 1957 as information on the growth of real wages, estimated at an average of only 4 per cent for the entire six year plan period, was particularly disturbing to the central planners. Further, riots broke out in June of 1956 in Poznan and brought much attention to the shortcomings of the economic and political system. Shortly afterwards a majority of the Politbureau decided to continue a policy of "democratization" and the Polish United Workers' Party (PUWP) Central Committee approved a program of political and economic reforms. These reforms, initially scheduled to be in effect for the first FYP, 1956-1960, allowed for further deviations from average costs based on (1) the good's productivity if it is a factor input, or (2) the market demand if it is a consumer good. In addition to price reform the number of centrally rationed inputs was decreased, as Table 2 indicates. The compilation of material balances was also being decentralized as economic ministries, industrial associations and supply organizations compiled their own balances independently of the central planning board.
Further, fewer and fewer of these balances had to be approved by the Council of Ministers or the Planning Commission.\textsuperscript{9}

Table 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Inputs</th>
<th>Number of Material Balances</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>1,575</td>
<td>2,000–3,000(a)</td>
</tr>
<tr>
<td>1957</td>
<td>1,088</td>
<td>-</td>
</tr>
<tr>
<td>1958</td>
<td>455</td>
<td>-</td>
</tr>
<tr>
<td>1960</td>
<td>325</td>
<td>-</td>
</tr>
<tr>
<td>1964</td>
<td>416</td>
<td>1,600</td>
</tr>
</tbody>
</table>

(a) Refers to the number of rationed inputs only


These and other reforms were being implemented throughout the 1956-1959 period,\textsuperscript{10} based on the work of the Economic Model Commission of the Economic Council\textsuperscript{11}. The five-year plan itself was one of transition: completing the first wave of investment begun in the six year plan and in 1958-59 beginning a new investment effort in anticipation of the second five year plan. The initial period, 1956-57, was marked by growth in personal income and agricultural production. As Table 3 indicates, consumption accounted for nearly 80 per cent of national income (consumption also accounted for 78 per cent of the increase in national income during 1956-57 whereas investment accounted for only 22%). However the share of consumption declined continuously after 1956. In addition to the growth in consumption, agricultural output increased during the initial years of the plan period.
Much of the increase may be attributed to the reform of the government's agricultural policy. The collectivization drive had reached its peak in 1955 with only 8 per cent of total agricultural output being produced by collectives. In 1956, the Polish Government returned to a policy favoring private agriculture and disbanding the collective. The positive benefits of a return to private agriculture were offset as implementation of reform policies in other areas slowed and investment allotted to agriculture decreased.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Zlotys</th>
<th>Percent</th>
<th>Consumption Zlotys</th>
<th>Percent</th>
<th>Accumulation Zlotys</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>272.6</td>
<td>100</td>
<td>210.5</td>
<td>77.3</td>
<td>61.9</td>
<td>22.7</td>
</tr>
<tr>
<td>1956</td>
<td>294.0</td>
<td>100</td>
<td>232.3</td>
<td>79.2</td>
<td>60.5</td>
<td>20.8</td>
</tr>
<tr>
<td>1957</td>
<td>334.0</td>
<td>100</td>
<td>288.2</td>
<td>77.3</td>
<td>75.4</td>
<td>22.7</td>
</tr>
<tr>
<td>1958</td>
<td>344.6</td>
<td>100</td>
<td>266.4</td>
<td>77.4</td>
<td>77.8</td>
<td>22.6</td>
</tr>
<tr>
<td>1959</td>
<td>368.9</td>
<td>100</td>
<td>283.3</td>
<td>76.9</td>
<td>85.3</td>
<td>23.1</td>
</tr>
<tr>
<td>1960</td>
<td>379.9</td>
<td>100</td>
<td>288.1</td>
<td>75.8</td>
<td>91.8</td>
<td>24.2</td>
</tr>
</tbody>
</table>

Source: See Appendix A, Table 20.

The reform movement had begun to lose momentum by 1957-58 and the reforms that were implemented were only partially successful for several reasons. First, in 1956 there was a realignment of prices, especially in industry, and a new set of principles of price formation. This realignment, which moved in the direction of more realistic scarcity relationships, brought on inflationary pressures. By 1957-58 many pre-1956 leaders had returned to prominent government posts after Władysław Gomułka replaced Bieryut as
First Secretary of the Polish United Workers Party. They then argued for a return to central control to combat these inflationary pressures. Second, industrial associations were created in 1958. These were groups of enterprises organized on an operational basis rather than the bureaucratic hierarchy. It was the intention of the reform-minded central planners that these associations were to be the basic plan executant. However, there was substantial institutional resistance from enterprises and a tendency within the planning hierarchy to "do it the old way." And third, as indicated in Table 4 there was a substantial increase in investment which favored transportation and communications, and construction in heavy industry. This relative neglect of agricultural investment neutralized any gains which may have resulted from the de-collectivization of agriculture. Although these reforms were only partially successful, the issue of economic reform was not dead. Economic inefficiency at the industry level still persisted and the growth in real wages stagnated throughout the 1960s (see Appendix A, Table 21).

Table 4

<table>
<thead>
<tr>
<th>Year</th>
<th>Industry</th>
<th>Construction</th>
<th>Agriculture</th>
<th>Transportation and Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>-6</td>
<td>47</td>
<td>41</td>
<td>-4</td>
</tr>
<tr>
<td>1956</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>-11</td>
</tr>
<tr>
<td>1957</td>
<td>2</td>
<td>40</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>1958</td>
<td>9</td>
<td>-13</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>1959</td>
<td>17</td>
<td>17</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>1960</td>
<td>3</td>
<td>24</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Source: Feiwel [70], Table 34, p. 614.
The 1961-65 five year plan was intended to "catch up" with the West. The economic reform movement slowed at both the theoretical and applied levels during the 1959 to 1964 period. However many features of market economies, from trade marks to after season sales,\textsuperscript{13} were reintroduced. By the end of the plan period there was a growing realization that many of the managerial problems of the old system still persisted. By 1965 new plans, which included substantial economic reforms, were prepared.

The actual performance of the economy during the second five year plan featured two distinct periods: (1) 1961 and 1962 in which there was an increase in investment and employment (as Table 5 below and Tables 12 and 13 of Appendix A indicate) continuing the targets and goals of the last five year plan, a high level of production of producer goods, poor agricultural performance (see Table 14 of Appendix A) and a surge in the balance of payments deficit (see Table 26 of Appendix A); (2) 1964-1965 (with 1963 as a transition period) marked by major changes in the plan, most notably a re-direction of investment expenditures (Table 5), lower growth of employment (Table 19 of Appendix A) and increased growth of consumer goods (as Table 6 indicates).
Table 5

Annual Rate of Growth of Investment Outlay by Sector of the Economy, 1960-1965

<table>
<thead>
<tr>
<th>Year</th>
<th>Industry</th>
<th>Construction</th>
<th>Agriculture</th>
<th>Transportation &amp; Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>10</td>
<td>24</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>1961</td>
<td>16</td>
<td>-6</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>1962</td>
<td>4</td>
<td>50</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>1963</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>1964</td>
<td>7</td>
<td>-4</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>1965</td>
<td>6</td>
<td>19</td>
<td>17</td>
<td>16</td>
</tr>
</tbody>
</table>

Source: Feiwel [72], table 34, p. 614.

Table 6

Incremental Change of National Income Distributed, 1961-1965
(In 1961 prices, billions of zlotys)

<table>
<thead>
<tr>
<th>Year</th>
<th>1961</th>
<th>1962</th>
<th>1963</th>
<th>1964</th>
<th>1965</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increment to National Income</td>
<td>27.6</td>
<td>11.0</td>
<td>26.4</td>
<td>21.7</td>
<td>38.9</td>
</tr>
<tr>
<td>Allocated to Consumption</td>
<td>17.6</td>
<td>11.0</td>
<td>14.7</td>
<td>15.4</td>
<td>21.6</td>
</tr>
<tr>
<td>Individual</td>
<td>14.4</td>
<td>7.7</td>
<td>13.0</td>
<td>12.6</td>
<td>17.9</td>
</tr>
<tr>
<td>Collective</td>
<td>3.2</td>
<td>3.3</td>
<td>1.7</td>
<td>2.8</td>
<td>3.7</td>
</tr>
<tr>
<td>Accumulation</td>
<td>10.0</td>
<td>0.1</td>
<td>11.7</td>
<td>6.3</td>
<td>17.3</td>
</tr>
<tr>
<td>Net Fixed Investments</td>
<td>5.3</td>
<td>11.5</td>
<td>0.8</td>
<td>3.8</td>
<td>10.2</td>
</tr>
<tr>
<td>Change in Inventories</td>
<td>4.7</td>
<td>-11.3</td>
<td>10.9</td>
<td>2.5</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Source: Feiwel [72], table 57, p. 319.

The overly ambitious targets for the five year plan could not be met. They were based on the assumption that intensive growth factors could be utilized as a result of the reforms in the system of management which occurred in the 1956-1958 period. Higher rates of productivity were assumed and built into the plan, but many of the reform
proposals had been set aside by the Gomulka leadership. Extensive patterns of growth re-emerged, as in the previous plan periods, and the growth in factor productivity was disappointing (see Tables 18 and 19 of Appendix A). Further, it was expected that during 1961-1965 both real wages and consumption would grow at the same rate: planned at 23% over the five year period. However, real wages grew by just 7.8%, or an average annual rate of about 1.5% (see Table 21, Appendix A). Real incomes increased only for a small percent of the population, most notably for those families for whom the number of hours employed increased. The low rates of growth of productivity, low rates of growth of real wages (as illustrated by Table 8 below and Table 21 of Appendix A) and continuing inefficiency at the enterprise level brought the discussion of economic reforms back to center stage. The problems are even more clear when Poland is compared to its East European neighbors in Tables 7 and 8.

Table 7
Indexes and Growth Rates of GNP per Capita 1950-1967

<table>
<thead>
<tr>
<th>Index</th>
<th>1950</th>
<th>1955</th>
<th>1960</th>
<th>1965</th>
<th>1967</th>
<th>Annual Percentage Increases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>76.8</td>
<td>100.0</td>
<td>135.6</td>
<td>179.2</td>
<td>203.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>89.3</td>
<td>100.0</td>
<td>130.3</td>
<td>141.1</td>
<td>154.1</td>
<td>2.3</td>
</tr>
<tr>
<td>East Germany</td>
<td>69.3</td>
<td>100.0</td>
<td>132.7</td>
<td>153.5</td>
<td>163.4</td>
<td>7.6</td>
</tr>
<tr>
<td>Hungary</td>
<td>80.8</td>
<td>100.0</td>
<td>118.9</td>
<td>143.7</td>
<td>158.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Poland</td>
<td>87.8</td>
<td>100.0</td>
<td>115.4</td>
<td>134.9</td>
<td>148.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Rumania</td>
<td>74.6</td>
<td>100.0</td>
<td>116.5</td>
<td>150.8</td>
<td>171.4</td>
<td>6.0</td>
</tr>
<tr>
<td>Yugoslavia</td>
<td>86.8</td>
<td>100.0</td>
<td>134.8</td>
<td>162.3</td>
<td>176.3</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Source: Alton [3], p. 47.
Table 8

Rate of Growth of Output, Employment and Labor Productivity
(yearly average)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP</td>
<td>6.1</td>
<td>7.3</td>
<td>6.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Employment</td>
<td>-</td>
<td>-</td>
<td>.3(^a)</td>
<td>-</td>
</tr>
<tr>
<td>Labor Productivity</td>
<td>-</td>
<td>-</td>
<td>7.4(^a)</td>
<td>-</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP</td>
<td>3.4</td>
<td>6.3</td>
<td>3.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Employment</td>
<td>1.7</td>
<td>1.2</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Labor Productivity</td>
<td>1.7</td>
<td>5.0</td>
<td>1.3</td>
<td>5.2</td>
</tr>
<tr>
<td>East Germany</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP</td>
<td>7.0</td>
<td>5.0</td>
<td>2.9</td>
<td>3.4</td>
</tr>
<tr>
<td>Employment</td>
<td>2.3</td>
<td>0.0</td>
<td>0.0</td>
<td>.2</td>
</tr>
<tr>
<td>Labor Productivity</td>
<td>4.7</td>
<td>4.9</td>
<td>2.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Hungary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP</td>
<td>5.4</td>
<td>3.9</td>
<td>4.5</td>
<td>5.4</td>
</tr>
<tr>
<td>Employment</td>
<td>2.3</td>
<td>1.1</td>
<td>.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Labor Productivity</td>
<td>3.0</td>
<td>2.7</td>
<td>3.6</td>
<td>4.1</td>
</tr>
<tr>
<td>Poland</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP</td>
<td>4.6</td>
<td>4.6</td>
<td>4.8</td>
<td>5.5</td>
</tr>
<tr>
<td>Employment</td>
<td>2.3</td>
<td>1.3</td>
<td>2.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Labor Productivity</td>
<td>3.0</td>
<td>3.3</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Rumania</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP</td>
<td>7.2</td>
<td>4.4</td>
<td>6.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Employment</td>
<td>2.3</td>
<td>0.4</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Labor Productivity</td>
<td>4.8</td>
<td>4.0</td>
<td>5.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Yugoslavia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNP</td>
<td>4.3</td>
<td>7.2</td>
<td>5.1</td>
<td>3.5</td>
</tr>
<tr>
<td>Employment</td>
<td>-0.4</td>
<td>0.7</td>
<td>-0.1</td>
<td>-1.8</td>
</tr>
<tr>
<td>Labor Productivity</td>
<td>4.7</td>
<td>6.5</td>
<td>5.2</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Note (a): 1956-65
Source: Alton [3], Table 15.
A new wave of reforms was thus initiated by the Fourth Congress of PUWP in June of 1964.\textsuperscript{17} It was recognized that the system, still highly centralized and dependent upon administrative commands, could mobilize resources and concentrate them in a few areas, but it still could not guarantee their efficient use.\textsuperscript{18} Further, due to the interaction of the extensive development strategy and the system of planning and management, an industrial structure dependent on extensive development, emphasizing production of producers goods and limiting the role of international trade, had evolved.\textsuperscript{19}

The economic reforms and the Third Five Year Plan (1966–1970) had several common goals: (1) to change the industrial structure of the economy, bringing it closer to that of the advanced West European countries, (2) to expand the production of exports and improve the profitability of foreign trade, and (3) to improve the generation of technology and utilization of research and development.\textsuperscript{20} There was also a feeling by economists in Poland that the solution to the problems they faced could not be found on the basis of a single theoretical model,\textsuperscript{21} thus they rejected the earlier work of the Economic Model Commission. The reforms stressed partial remedies and emphasized that improvements were to be a continuous process. Specifically, the reforms attempted to: (1) improve the system of success indicators and managerial incentives (Managerial bonuses after 1964
were based on enterprise profitability as well as gross output, and in 1965 the main success indicator for enterprises and industrial associations was to be profitability.); (2) improve the methods of planning the enterprise wage fund (In 1964, the size of the enterprise wage fund, from which basic wages and employee bonuses are derived was made dependent upon the fulfillment of an obligatory task, such as production of a given product mix, and the degree of fulfillment of a bonus condition: the profitability plan. In 1966 new instruments were introduced to allow firms to earn bonuses for meeting sub-contract delivery deadlines, etc.); (3) improve the financial system of enterprises and industrial associations (New regulations introduced in January 1966 attempted to expand both the quantitative and qualitative limits of decentralized financial decisions as enterprises were encouraged to formulate their own "alternative" plans); (4) increase the role of industrial associations and decrease the role of ministries (In 1965, various government statements indicated the role of associations in product specialization and planning was to increase substantially). 22

The Third Five Year Plan called for a further development of the natural resource base and higher rates of growth of investment, especially in the machine building and chemical industries. The actual performance of the economy can again be broken into distinct periods: The first, 1966 to
1968, was marked by above plan growth in national income (see Table 14 of Appendix A) and industrial output, which grew at a yearly average of about 8 per cent.\textsuperscript{23} This was brought about largely through high rates of investment and employment (see Tables 12 and 13 of Appendix A), rather than increases in technological change or factor productivity (see Table 9 and Table 23 of Appendix A). There was also much better than average performance in agriculture (Appendix A, Table 14) as overall output grew by about four per cent per year.

In the second period, from 1969 to 1970, a severe drought and harsh winter in 1969 resulted in a decrease in agricultural output and increased imports of grain (see Table 14 and 26 of Appendix A). As a result of the increased imports of grain and above plan imports of machinery there was a marked deterioration in the balance of payments (see Table 26 of Appendix A). By late 1970 the rate of growth of national income had fallen (see Table 14 of Appendix A) and investment was below planned levels.\textsuperscript{24}

The performance of the economy in the earlier sub-period was generally quite acceptable with one exception. The reforms of the 1964-1966 period gave enterprises much more discretion in investment and hiring decisions. As a result firms were often spending at greater than planned levels. By 1968 difficulties in supplying inputs to industry were beginning to arise as shortages and inflationary pressures began to build. These finally brought about pressures for a
Table 9

Rate of Growth of Output, (a) Employment, (b) and Labor Productivity (c)

<table>
<thead>
<tr>
<th></th>
<th>1965-70</th>
<th>1970-75</th>
<th>1965-75</th>
<th>1976(d)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bulgaria</strong></td>
<td></td>
<td></td>
<td></td>
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<td>5.2</td>
<td>N.A.</td>
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</table>

Source: Alton [2], Tables 18, 22, 23

Notes:  
(a) Average annual growth rate at constant prices, in per cent  
(b) Average annual growth rate  
(c) Average annual growth rate at constant prices, in per cent  
(d) 1976 estimate of average growth rate of employment is preliminary
return to administrative control\textsuperscript{25} as plan failures in many industrial sectors resulted from shortages of semi-fabrics and electricity.\textsuperscript{26} Also new reforms, to alleviate these supply problems and encourage enterprises to stay within planned spending, were being designed and implemented during 1969 and 1970 for operation of the 1971-1975 five year plan. These reforms however were relatively short lived.

The 1969-1970 reforms had two distinct features. The first was the change in the planning system (announced in April of 1969) and management methods (announced somewhat later). The most notable changes dealt with (a) the financial system (a new system of bonus criteria from which the enterprise could choose\textsuperscript{27} and new methods of financing research and development), (b) reform-realignments of transfer prices for domestic goods, to be implemented in stages (and for imported goods the transfer price was now the "transaction price", the price paid in foreign currency multiplied by an exchange rate which differed if the imports were produced in socialist, capitalist or developing countries), and (c) a radical reform of the incentive system (which related all potential pay raises for 1971-75 to the 1970 level of enterprise wage funds\textsuperscript{28}, \textsuperscript{29}.

The second distinct feature of the 1969-70 reforms is their anti-inflationary, anti-consumer nature. The reform of the incentive system was intended to slow the growth of
nominal wages, which was thought to be the cause of much of the inflationary pressure.\textsuperscript{30} As a result, the expansion of employment was slowed as redundant workers were dismissed and planned increases in employment in several sectors were halted.\textsuperscript{31} Although it was argued that these measures were necessary to increase productivity, most workers viewed the new system simply as a means of decreasing wages. On December 13, 1970 a reform of retail prices was announced which included an average eight per cent increase in the price of foodstuffs. The reaction of the population was quick, as the next day dockworkers and shipyard workers in Gdansk went on strike in protest. The strike was joined by others and violence erupted. The local Party headquarters was burned and shops wrecked. The riots quickly spread to Gdynia, Elblag and Szczecin. By the end of the week order was restored only by deployment of troops and tanks. The events caused a crisis in the Party leadership and within days Edward Gierek was elected First Secretary of the Polish United Workers Party replacing Wladyslaw Gomulka.\textsuperscript{32}

Gierek immediately initiated a "New Economic Maneouvre" designed to bring an immediate increase in the standard of living and set a new course in the development strategy of Poland. Immediate, short run, improvements in the standard of living were brought about by: (1) increasing wages and pensions in the lowest income brackets, (2) completely eliminating the new system of bonuses which depressed wages,
and (3) cancelling the increase in food prices, but maintaining the reduction of certain consumer goods of industrial origin. Further improvements in the standard of living were expected as a new agriculture policy evolved. The new policy was designed to increase agricultural output by: (1) for the first time the government granted formal certification of property rights to owners of agricultural land and removed legal barriers to the sale and inheritance of land, (2) in 1972, workers in the rural economy were included in the national health insurance program, (3) obligatory and contractual delivery prices for agricultural products were raised in 1971, and obligatory deliveries were entirely eliminated in 1972, (4) the steep progressivity of farm land taxes was eliminated, and (5) credit for the purchase of equipment and fertilizers became more readily available. All of these combined to increase income in the agricultural sector by over ten per cent in 1971 and over nine per cent in 1972 (see Table 21 of Appendix A).

In addition to the measures intended to increase the standard of living, major reforms in the system of planning and management were implemented in 1972 and 1973, to replace those of the 1969-1970 period, and a new development strategy was formulated. The systemic changes were based on several assumptions: (1) that different development strategies need different systems of planning and management, (2) the reforms would again be only a part of the continuous
process of improving the economic system, (3) all of the partial systems should be consistent among themselves, compatible with the entire system, and therefore introduced initially only on an experimental basis, (4) a system of economic parameters determined by the central planners would "steer" the economy, and (5) the scale of management should be enlarged, and closer links between production, research and development, and marketing should be established. 37

The development strategy called for both high levels of investment expenditures to modernize the productive capacity of the economy and build a strong export sector, and high levels of production of consumer goods in order to improve the standard of living and increase labor productivity. Increased imports of advanced machinery and Western credits to finance them was the foundation of this investment drive. In order to increase the utilization of these high technology imports, expand the domestic research and development effort and improve labor productivity, a new system of planning and management was also implemented.

The new system, currently in operation, depends heavily upon the "Wielkie Organizacje Gospodarcze" (WOGs), or "large economic organizations". These were associations of many enterprises or industrial complexes in which more of the day-to-day planning and operational decisions were to be made. In addition, more control over investment funds was granted to each WOG as not only the producing enterprises, but also
research and development institutions and internal and
foreign trade organizations were placed under its jurisdic-
tion. To a large degree the reforms constituted a change in
industrial organization, with more autonomy given to the
larger units. The WOGs' success was determined on the
basis of two indicators: (1) production added (roughly
equivalent to value added) and (2) profit. The rate of
growth of each WOG's wage fund was tied to production added
and profits were divided into various funds, including those
for the repayment of credits and those for managerial
bonuses. Control of the WOGs by the ministries was ensured
since long term parameters governing the level of tax free
profits kept by the WOG, and guidelines for the participation
in foreign trade for each WOG were set by planners at the
ministries or the Central Planning Board. Other
parameters set by the central planners included certain
prices, the rate of interest, rates of amortization, foreign
trade coefficients, subsidies for the production of normally
unprofitable goods, price equalization subsidies and taxes on
exports and imports, and so forth.

The new organizational scheme was introduced gradually.
In mid-1972 thirty-five large economic organizations were
formed. In 1974 there were 68 WOGs in the industrial sector
alone, which accounted for nearly 45 per cent of output, and
39 per cent of employment, in socialist industry. In 1975
the system had continued to expand and accounted for 68 per
Table 10

Indexes of Real GNP Per Capita, 1965-1976
(1965 = 100)

<table>
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<td>124.4</td>
<td>152.0</td>
<td>158.4</td>
<td>4.5  4.1  4.2</td>
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<td>117.0</td>
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<td>134.9</td>
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<td>142.8</td>
<td>3.1  3.6  2.7</td>
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<td>114.1</td>
<td>133.1</td>
<td>134.0</td>
<td>2.7  3.1  .7</td>
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<td>Poland</td>
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<td>162.4</td>
<td>3.3  5.7  4.6</td>
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<td>156.7</td>
<td>166.1</td>
<td>3.7  5.7  6.0</td>
</tr>
</tbody>
</table>

Source: Alton [2], Table 12.
cent of output and 61 per cent of employment in industry, 100 per cent of all state owned internal trade and catering establishments, and substantial portions of other sectors of the economy. 41

In the 1971-75 period it appears that the "New Economic Maneouvre" was successful in increasing the standard of living (see Table 21 of Appendix A) and labor productivity (Table 19 of Appendix A). In addition, the annual rates of growth of national income and of production in every sector showed substantial increases in the 1970-74 period. However, there was a substantial fall in agricultural output due to poor weather conditions in 1974 and 1975 (see Tables 18 and 19 of Appendix A). Agricultural output recovered and grew rapidly in 1976 and 1977 alleviating this set back. The success in terms of economic growth may be attributed to two major factors: (1) again there was extensive development as both fixed capital and labor grew substantially in the industrial sector (see Tables 18 and 19 of Appendix A) and (2) there was a tremendous increase in imports of machinery and equipment from the West (as evidenced in Table 26 of Appendix A), leaving Poland with substantial hard currency debts to repay. 42 These two factors may have been successful in modernizing the Polish industrial base.

The success of Gierek's "New Economic Maneouvre" was not complete however, inflationary pressures began to develop (see Table 20 of Appendix A) and the growth of exports was
not enough to alleviate Poland's hard currency debt which had reached $10.2 billion by the end of 1976.\textsuperscript{43} Although the share of national income going to consumption increased from 62.2\% in 1975 to 68.5\% in 1977 (see Table 20 of Appendix A), there was a slowing in the rate of growth of real wages from 8.5\% in 1975 to 3.9\% in 1976 and 2.3\% in 1977 (see Table 20 of Appendix A) and a corresponding increase in the cost of living.

The slowing in the rate of growth of real wages and price increases led to worker unrest. The announcement of price increases on June 25 of 1976 triggered riots in Ursus, Radom and other locations throughout Poland.\textsuperscript{45} These riots succeeded in forcing the government to roll back the scheduled price increases and contributed to growing political unrest. Dissident intellectuals banded with workers to protest both political and economic conditions.\textsuperscript{46} There was also evidence of growing excess demand in both 1976 and 1977 which may be impossible to remove without price increases.\textsuperscript{47}

In addition to these internal pressures for economic reform, Poland, by 1977, had reached the "second phase" of Gierek's development strategy: it was necessary to generate large amounts of exports to repay the loans from the West which financed the initial phase of the development program. As a result the need for increased efficiency and rational prices is still continuously emphasized.\textsuperscript{48} It is only
recently, during two conferences in late 1978, that new reform proposals have been made and economists in Poland recognize the basic flaws of the WOG system with respect to microeconomic efficiency. (The results of the systemic reforms, with respect to enterprise management, i.e. the WOG system, should be kept distinct from the results of the development strategy of the New Economic Maneouvre).

There is a reluctance on the part of the central authorities to implement a new system of planning and enterprise guidance for three basic reasons. The reform of the political and economic system may result in (1) greater inequality in the distribution of income and wealth, (2) an increase in unemployment, and (3) a continuing increase in wages and prices.

In conclusion we must note that (1) Polish economic development has not been balanced with respect to producers vs consumers goods production, (2) a continuous process of economic reform has moved the Polish economic system even further from the classical CPE, (3) the most recent major reforms have led the Polish economic system to a new, higher degree of openness and vulnerability to world economic disturbances and (4) the pressures for economic reform and movement toward a rational price system have not abated as a result of the introduction of the WOG system or the development strategy of the New Economic Maneouvre. Let us now turn, in the Chapters which follow, to an analysis of the response of the Polish economy both in terms of the planners
and the individual actors of the economy, to exogenous disturbances (primarily the increase in world prices) which had occurred in the 1965-1975 period. After a brief survey of recent literature dealing with modeling the MCPE we shall develop a model of the hypothetical MCPE in the above historical context.
Notes to Chapter 2

(1) Throughout the text the measure of national income used is Net Material Product Produced Domestically.

(2) Secomski [193], pp. 45, 66.

(3) No attempt is made to compare growth of national income over the period using comparable geographic areas. In fact newly acquired Western areas of Poland accounted for a large share of the growth in output of industrial goods: over 50 percent of all coke, lime, cardboard and radio receivers, nearly 100 percent of lignite and coal electrodes. See Secomski [194] for further details.

(4) Accumulation is investment in fixed capital and changes in reserves and inventories.

(5) See Montias [156] for a discussion of the problems Polish planners encountered in setting prices of producer goods in this period.

(6) See Fiewel [30] for more details of the growth of consumption and income during this period.

(7) The Poznan riots were first denounced by Moscow and then Warsaw as "provocation inspired by imperialist circles." But the Polish official attitude changed abruptly on July 1, as the disturbances were attributed
to the general neglect of the standard of living by the planning authorities. See Zielinski [242] for further details.

(8) See Montias [155] for a discussion of the rationale behind the Central Planning Board's pricing strategy and the exceptions to average cost pricing.

(9) This period is labeled the period of thought "towards a grand design" by Zielinski [242] as much of the discussion concerns transition to a new economic model or system. See his work and Montias [154] for further discussion.

(10) See [242] and Montias [154] for a discussion of the Theses.

(11) See Montias [154] who relates the concern of many Polish economists and the publication of many examples of inefficiency and waste in Gospodarka Planowe and Życie Gospodarcze which by 1956 had become legitimate economic journals rather than propaganda instruments.

(12) See Zielinski [242], for further details.

(13) Gomulka was regarded as a champion of "democratization," but was faced with restoring order to Poland which was being swept by anticommunist sentiment. Only his personal appeal and the threat of Soviet intervention, as had just occurred in Hungary, kept a majority of voters from crossing out communist
candidates in the general election of the Sejm.
To calm the population Gomulka made concessions to
the Catholic Church, ended the Communist Youth Move-
ment program and began the program disbanding the
collectives. However, he soon rejected the Economic
Commission's more radical proposals for economic
reform and proceeded more cautiously.

(14) In fact, as much as 84 percent of the increase in
industrial output was to be obtained solely through
an increase in labor productivity achieved by technical
progress and a more rational and more intensive use
of inputs. See Feiwel [70], chapter 7 for details.

(15) Feiwel [70], p. 321.
(16) Feiwel [70], p. 322.
(17) See Zielinski [233], p. 16.
(18) Fallenbuchi [66].
(19) Fallenbuchi [64], p. 821.
(20) Fallenbuchi [64], p. 821.
(21) Zielinski [242], p. 17. The stress was on partial
remedies, rather than a large change to a new econo-
ic model. These partial remedies however may
encompass quite large sections of the economy.
(22) See Zielinski [242] for a more detailed analysis of
the 1964-66 reform period.
(23) Fiewel [70], p. 403. Only Bulgaria and Rumania had higher rates of growth at any time during the 1961-68 period.

(24) See Feiwel [70], table 96, p. 432.

(25) Zielinski [242], p. 17.

(26) See Feiwel [70], p. 402. In 1968 the requirements for electricity grew by 11 percent while generating capacity was hindered by delays in commissioning new plants and work stoppages at power plants. Further, in the semifabricates, auxiliary materials, and castings and forgings sectors output did not keep pace with demand. Some of these shortages were made up by increased imports.

(27) Enterprises managers could select one of the following four bonus criteria for evaluating the enterprises' performances: (1) the decrease in unit costs of production, (2) final cost levels, (3) volume of production, or (4) rate of profitability.

(28) Polish enterprises were pressured into revealing all wage fund reserves in 1969-70 so that under the new incentive system nominal wages were not likely to increase over the next two years. See Zielinski [242] for further details.

(29) See Zielinski [242] for more detail with respect to changes in the financial and incentive system.
(30) The planners were attempting to restrain aggregate demand but much of the inflationary pressure could be attributed to plan failures and shortages in particularly crucial areas (semi-fabrics) which reduced aggregate supply (especially of consumer goods and services). See Zielinski [242].

(31) See Zielinski [242].

(32) See Pelczynski [166] for an excellent day-by-day description of the political events leading to Gierek's election to the Secretarial post.

(33) In addition to these economic measures there were further concessions to popular sentiments. These included rebuilding of the old royal castle in Warsaw and normalizations of relations with the Catholic Church. See Chrypinski[43] for further details with regard to political concessions.

(34) See Fallenbuehl [64] for a more complete description of the new economic measures implemented.

(35) See Lipski [135] for a more detailed description of the changes in agricultural policy.

(36) The system of planning and management after 1973 will be discussed more fully in the next chapter as the economy is modeled on a sector-by-sector basis.

(37) See Fallenbuehl [64] for more details.
(38) The "large economic organizations" now began to resemble modern Western corporations in their scale, composition and management, but they have to follow the directives of the central planners. See Fallenbuechel [64] for further detail.

(39) Much more detail will be given with respect to the normatives and operations of WOGs in Chapter 3 as we model each sector of the economy.

(40) See Machowski [128], Adam [1], Tyminski [217] and Fallenbuechel [64] for further details of the new system. These shall be further elaborated in Chapter 3.

(41) The WOGs were expected to grow even further in 1976 and 1977, as Fallenbuechel [64] points out.

(42) See Teske [210] and Zoeter [245] for a discussion of Poland's growing hard currency debt.

(43) Zoeter [245], p. 1356.

(44) The price reforms were undertaken in part to reduce the excess demand for foodstuffs, which were heavily subsidized and capital intensive, by increasing their price relative to consumer durables, which were in general profitable manufacturing products. Gomulka [84], p. 17. Further, Wanless [228] notes that the domestic price reforms were the first casualty of the reforms implemented in 1973.
(45) See Conner [45].

(46) See Staniszkis [205].

(47) See Gomulka [84].

(48) See Marczewski [148], Mieczkowski [152], Czerwinski [48] and Zielinski [242].

(49) Zielinski [243] notes that there have been two economic conferences discussing reform of the system of economic planning and guidance. The first conference was held in Wroclaw, in September of 1978 and entitled "Direct Instruments in the Management of Industrial Economic Organizations" and the second conference was held in Warsaw in November of 1978 and entitled "An Internally Consistent Mechanism of the Functioning of a Socialist Economy." The detailed proceedings of these conferences are not yet available.

(50) Zielinski [244], p. 5, points out that most economists in Poland are "very conscious of the failure of the new economic and financial system, the collapse of the WOG reform." This apparent failure to achieve micro-economic efficiency must be kept distinct from the overall goals of the NEM. In the model developed in Chapter 4 it is clear that the WOG system will, in general, not allocate factor inputs efficiently (when compared to the profit maximizing firm).

(51) Gomulka [84], p. 21.
Chapter 3: A Review of the Literature

3.0 Introduction

In this chapter we shall first specify the issues addressed in the Western literature which are crucial to our analysis. Then after a brief discussion of the approaches used in the analysis of MTE adjustment mechanisms for perspective, the CPE and MCPE shall be discussed using Wolf's archetype. A review of the Eastern literature shall conclude this section.

3.1 The Western Literature

The issues critical to our analysis are: (1) the applicability of MTE adjustment mechanisms and western types of analysis to a CPE (as discussed in Chapter 1); (2) the CPE adjustments, emphasizing the "real" channels of transmission (Holzman [101], [103]); (3) the role of the PE mechanism, exchange rates and inflationary impact of exogenous disturbances (Holzman [101], [103], Ames [8], Pryor [180] and Wolf [237], [238], [239], [240]); (4) the analysis of exogenous disturbances in an internal vs external balance context for a CPE and MCPE (Wolf [238], [241]); (5) the specification of a CPE in a disequilibrium framework in order to examine foreign trade adjustments or repressed inflation (Brada [27], [29], Portes [171], [172]). Since several of the problems we wish to examine can be described in an internal-external balance framework let us first consider
a CPE (or in some cases a MCPE) in this context, specifying the initial conditions, the potential adjustment and the issues which arise.

Recall that in a MTE there are three basic approaches to the analysis of BOP adjustments. The first is the elasticities approach. Wolf [241], following the traditional Bickerdike-Robinson-Metzler approach shows that any change in the foreign currency balance of payments \( (B^*_T) \) for a small open MTE, caused by external price changes or changes in the quantity of exports can be expressed as:

\[
(1) \quad dB^*_T = V^*_x \left[ \frac{\hat{p}^*_x}{\hat{m}^*_x} (\epsilon^*_x + 1) - d^*(\eta^*_m + 1) \right] + \hat{q}^*_x,
\]

where * denotes foreign prices, ^ denotes a relative change, 
\( t^* = \frac{\hat{p}^*_x}{\hat{p}^*_x} \), \( V^*_x = p^*_x \cdot q^*_x \), \( V^*_m = p^*_m \cdot q^*_m \), \( d^* = \frac{V^*_m}{V^*_x} \), \( \epsilon^*_x \) and \( \eta^*_m \)

are the price elasticities of home's supply of exports and demand for imports. From this expression it can readily be seen that the effect of \( p^*_m \) or \( q^*_m \) upon \( dB^*_T \) is dependent upon the initial trade balance \( (d^*) \), the terms of trade \( (t^*) \) and the relevant elasticities. This approach can readily be applied to a CPE, assuming the elasticities reflect the authorities' response to changes in the prices of traded goods.

A second approach often used in the Western literature is the absorption approach. In this case any change in the domestic currency balance of trade, \( (dB_T) \) can be written as:
(2) \(dB_T = dY - dZ = dH\).

That is, any change in the domestic currency balance of trade is the difference between changes in domestic income \((dY)\) and absorption \((dZ)\). This difference is also equal to the change in hoarding \((dH)\). In this approach a deterioration in the trade balance \((dB_T < 0)\) implies domestic expenditure has risen relative to income. If there is external inflation transmitted to the domestic economy by a fixed exchange rate, the trade balance worsens only if the increase in money absorption of both domestic and foreign output \((d\bar{Z}_d\text{ and } d\bar{Z}_f)\) respectively, where \(dZ = d\bar{Z}_d + d\bar{Z}_f\) is greater than the increase in the money value of domestic output (expressed as \(dY = d\bar{Z}_d + d\bar{Z}_d^*\) where \(d\bar{Z}_d^*\) is foreign expenditure on domestic output). In other words, if \(d\bar{Z}_f\) (imports) increases relatively more than \(d\bar{Z}_d^*\) (exports) the trade balance worsens \((dB_T < 0)\).

A third approach is the monetary approach. Assuming the money supply \((M)\) consists only of the liabilities of the central bank \((CB)\) then it can be expressed as the difference between the CB's assets, (the net international reserves expressed in terms of domestic currency \((F)\), and loans \((L)\)), and its non-monetary liabilities (government deposits \((Dg)\)): \(M = F + L - Dg\). The balance of payments \((B_T)\) can then be written as:

(3) \(B_T = dF = dM - (dL - dDg)\).
From this viewpoint a deterioration in the balance of payments \((dB_T < 0)\) arises when the rate of change in domestic credit creation \((d(dL - dDg))\) is greater than the rate of change in the supply of money \((d(dM))\) and this excess credit creation "leaks" abroad as an excess of absorption over income.

In their definitional form these approaches, and equations (1) - (3) are applicable to a CPE. So let us examine the CPE under various conditions. Consider the response of a CPE to external inflation. Suppose that \(dP^*_m = dP^*_x > 0\), so the terms of trade do not change \((t^* = 1\) in equation (1) and trade is initially balanced \((d^* = 1)\). If the CPE's response is to maintain trade flows unchanged, and here there is no reason to change them, equation (1) indicates \(dB^*_T = 0\).

The total net profits on price discrepancies can be written as:

\[
A = Q_m(P_m - P^*_m R) + Q_x(P^*_x R - P_x)
\]

From this Wolf [24] shows the change in PE profits due to changes in external prices or quantity of exports is:

\[
dA = V^*_x R[\hat{P}^*_m(\frac{1}{t^*} \left[ \sigma_x (1-\alpha_x) \right] - d^*[\eta_m (1-\alpha_m)+1])
+ \hat{Q}_x (1-\alpha_x)]
\]
where }\alpha_x = \frac{P_X}{P_X} \cdot \frac{1}{R}, \alpha_m = \frac{P_m}{P_m} \cdot \frac{1}{R}, \text{ and all other symbols are previously defined. In this case not only is } dB_T^* = 0, \text{ but } dA = 0 \text{ also.}

If, on the other hand, we have an initial trade deficit } (d^* > 1.00), \text{ external inflation, with no change in the terms of trade } (dP_m^* = dP_x^* > 0, t^* = 1), \text{ and real trade flows are maintained, then } dB_T^* < 0 \text{ and } dA < 0. \text{ A third set of initial conditions to be examined more carefully is when the foreign price of imports increases } (dP_m^* > 0), \text{ the foreign price of exports does not change } (dP_x^* = 0 \text{ so } 1/t^* = 0) \text{ and trade is initially balanced } (d^* = 1). \text{ In this case, if the policy response is to maintain trade flows, } dB_T^* = -\gamma P_m^* m_m < 0 \text{ and } dA = -RV_m^* P_m^* m_m < 0. \text{ In all of the above cases we have assumed that the policy response has been to maintain real trade flows. The results derived (by Wolf [241], [238]) in the two later cases indicated that the foreign currency balance of trade deteriorates and net PE subsidies to offset A must increase (as A decreases). As Holzman [101] argues, if real trade flows are maintained there are few direct income effects (and therefore income related multiplier effects) in the pure CPE because the production and distribution of goods and services are determined by direct control.}

With regard to the PE subsidies however, Holzman argues that if the MFT experiences such a loss and the government grants the MFT a credit, or a subsidy (presumably taking away funds from some other agency and granting credits to those
other agencies), the result is inflationary. He suggests it is "the smallness of the foreign trade sector . . . and the policy of a fairly strict balancing of accounts . . . that makes this point of greater theoretical than practical interest." It is extremely important to clarify the role of PE subsidies because we have seen that the net losses (profits) in foreign trade and therefore the PE subsidy (tax) may change as a result of an external exogenous disturbance. And, it is only through the changes in the MFT's profits and in the subsidies that any effect, other than actual changes in real imports or exports, could be transmitted to the domestic economy. Thus, if the effect, if any, of changes in MFT profits can be nullified then the total exogenous disturbances can be (if real trade flows are maintained).

Further, foreign trade may be much more important for East European CPEs than for the USSR, with which Holzman was concerned. In fact in the MCPE such as Poland foreign trade may be even more important since some goods are not subject to PE subsidies. Also, in Poland, trade is unbalanced and is a much larger percent of GNP than in the USSR. Thus, the problem is no longer just of theoretical interest but is also of practical importance.

Holzman [101], in discussing the PE subsidies, continues an argument by Ames [8], and suggests that: (1) if the exchange rate \( R \) is equal to the purchasing power parity for both exports and imports \( (\alpha_m = \alpha_x = 1 \) and \( \beta = \frac{\alpha_m}{\alpha_x} = 1 \),
then $A = 0$, whether trade is balanced or not (i.e., regardless of $d^*$), (2) if $R$ does not equal the purchasing power parity ($\alpha_m^*$, $\alpha_x^* \neq 1$) but trade is balanced, ($d^* = 1$), then $A = 0$ and (3) only if $R$ does not equal purchasing power parity ($\alpha_m^*, \alpha_x^* \neq 1$) and trade is imbalanced ($d^* \neq 1$), will $A \neq 0$ (i.e., $\alpha_m^*, \alpha_x^* \neq 1$ and $d^* \neq 1$ are necessary for $A \neq 0$). But Wolf shows that:

$$A = RV_x^* [d^* (\beta \alpha_x^* - 1) + (1 - \alpha_x^*)]$$

and Holzman's second and third contentions are incorrect. From equation 6 we see that it is $\beta$ that is important, not merely whether $R$ is at purchasing power parity ($\alpha_m^*, \alpha_x^* = 1$) or not. If $\alpha_m^*, \alpha_x^* \neq 1$ and $d^* = 1.00$ (Holzman’s conditions in (2) above) but also $\beta \neq 1.00$ then $A \neq 0$, which contradicts Holzman’s conclusion. Further as equation 6 shows $A$ may be zero even if both $d^* \neq 1.00$ and $\alpha_m^*, \alpha_x^* \neq 1.00$, contradicting Holzman's third claim. In general if $\beta \neq 1.00$, $A = 0$ only if $d^* = \frac{\alpha_x^* - 1}{\beta \alpha_x^* - 1}$ and we would expect $A \neq 0$ in most cases where $\beta \neq 1.00$.

Wolf's expression makes clear when PE subsidies will arise, but what about the inflationary impact of these subsidies? Let us return to the example above, the third set of initial conditions: $dP_m^* > 0, dP_x^* = 0$ so $1/t_x = 0$ and trade initially balanced, $d^* = 1$; and the first policy response: no change in trade flows. As Wolf notes there are several methods of financing the increased subsidies (to
offset \( d_A = RV^*_m \hat{P}^*_m < 0 \). These can best be illustrated by equation 3, where the "*" indicates the valuta (or devisa) value of the foreign trade balance \( B'_T = B^*_T R \):

\[
(7) \quad dB'_T = dM - (dL - dDg) < 0
\]

and the fact that \( dA = dB'_T - dB_T \) (in this case \( dB_T = 0 \) since there are no changes in real trade flows or domestic prices).

The first option for financing the subsidies is for the treasury to draw down its CB deposits \( (dDg < 0) \) without altering net loans or the money supply \( (dM = dL = 0) \) so \( dB'_T = dDg \). In this case there is no inflationary impact. The second option for financing is for the treasury to increase taxes on households and enterprises \( (dM < 0, dL = dDg = 0) \) and \( dB'_T = dM < 0 \), which is contractionary and leads to an unnecessary reduction in domestic absorption and output. The third option is to finance the increased subsidies by borrowing from the CB, \( (dL > 0, dM = dDg = 0) \) so \( dB'_T = -dL \).

The authorities can maintain real domestic absorption by either the first or third option and it is clear that changes in the subsidies are not necessarily inflationary or contractionary, but the impact depends on the method of financing.

Suppose now with the same initial conditions \( (d^* = 1, 1/t^* = 0) \) the authorities choose to decrease real imports in order to maintain the valuta balance \( (dB'_T = dB^*_T = 0) \). In this second policy response, \( \eta_m = 1.00 \) and from Wolf [241].
(8) \( dB_T = V_x [\frac{\hat{P}_m^*}{m} \left( \frac{\varepsilon_x}{t^*_m} - d^n + \hat{Q}_x \right) ] \),

so \( dB_T = V_m \hat{P}_m^* < 0 \) and from (5): \( dA = -V_m \hat{P}_m^* < 0 \).

In this case, in which imports are reduced, there is not only a decrease in MFT profits (increase in subsidies) but also an impact due to changes in real trade flows which Holzman emphasizes. The decline in real imports will have a different impact depending on whether the imports are consumer goods or producer goods. If they are consumer goods the increase in enterprise deposits, as a result of not purchasing these imports will be offset by a decline in retail sales and the initial or first round result will be an increase in household money holdings (\( dM > 0 \)) as Wolf points out.

If they are producer goods the effect will be quite different. Holzman notes there will also be a "bottleneck multiplier effect." That is, "output will decline . . . to a greater extent than the value of the original decline in imports . . . because many of the products of enterprises that use imported materials directly are intermediate products themselves" which further disrupts the economy.³

The resulting decline in final output is seen to depend not only on the initial decrease in imports but also on the ratio of imports to output in the industries affected and the substitutability of other domestic intermediate goods for those imports and the goods produced by those imports.
In addition to the real effects there is a decrease in MFT profits. These again may be financed in several ways. The first option, here, is to borrow from the CB (assume the Treasury maintains constant deposits though, \( dDg = 0 \)) so expression (7): \( \frac{d\bar{B}'}{T} = d\bar{M} - (dL - dDg) \) now is zero and \( d\bar{M} = dL > 0 \). Further, Wolf shows \( dB_T = -d\bar{Z} \), (from 2) or the government is forcing an increase in hoarding. Assuming that the imports are only of consumer goods, consumers may attempt to spend their accumulated cash balances, creating inflationary pressures.

The second financing option, increasing taxes or reducing government expenditures eliminates the inflationary impact, however, as \( d\bar{M} = 0 \). In both cases, however, real absorption has fallen. Under either financing method (repressed inflation or direct taxation) there may be, as Brada [29] points out, disincentive effects in the labor market as a result of the decrease in real absorption, causing a further decrease in output.

Now consider a third policy response to \( d\bar{P}^*_x > \frac{d\bar{P}^*_x}{x} > 0 \) (and \( d^* = 1 \) still). Here \( t^* > 1 \) and \( \varepsilon_x > 0 \). Suppose the authorities choose to increase exports just enough to maintain the foreign currency balance unchanged (\( B^*_T = dB^*_T = dB_T' = 0 \), \( \bar{Q}_x > 0 \)) and do not change imports (\( \bar{Q}_m = \eta_m = 0 \)). In this case the results are basically the same as when imports are reduced, unless the exports come solely from
inventories (as Hoeffding [98] suggests might be a possibility). Holzman [101] however notes several "fiscal" effects. Again it is important to differentiate between consumer and producer goods, now due to the tax structure in CPES. There is a tendency for rather high turnover taxes on consumer goods, and rather low turnover taxes on producers goods. As a result there may be a loss of tax revenue greater for the export of consumer goods than the export of an equal amount of producers goods. Holzman then argues that an export of consumer goods would be more inflationary than an equal export of producer goods because the tax loss would be larger. However, it would appear that there are several ways of financing this tax loss (as in the PE subsidy case) and the tax loss per se may not be inflationary at all if it can be financed with no change in the domestic money supply.

Thus far we have seen that there are several responses the authorities of a CPE may choose (\( \hat{Q}_x = \hat{Q}_m = 0; \hat{Q}_x = 0, \hat{Q}_m < 0; \hat{Q}_x > 0, \hat{Q}_m = 0 \)) and several results: there are indirect effects due to changes in PE subsidies which vary according to the means of financing (if financed properly there should be no effect if there is no change in real trade flows) and if there are changes in trade flows there may be bottleneck multipliers, reduced absorption of consumer goods, indirect labor market effects, and other possible fiscal effects. The above deals only with a CPE though. Only Wolf [241], [239], [238] has examined a MCPE and we shall now turn to this problem.
Recall that in a MCPE there are two sets of traded goods: A goods which are subject to PE subsidies and B goods, those which are no longer subject to PE subsidies. We can write:

\[ B^*_T = B'_{TA} + B'_{TB} = dm - (dL - dDg) \text{ or } BT = BTA + BTB \]

where the A and B subscripts refer to the balance of trade in those goods only. We can further write the international price arbitrage equations as:

\[ P_A = P^*_A \alpha_A \text{ and } P_B = P^*_B \rho_B \]

where \( P_A \) is constant and thus \( \hat{\alpha}_A = - (\hat{P}^*_A + \hat{\rho}) \), \( \alpha_B \) is constant and thus \( \hat{P}_B = \hat{P}^*_B + \hat{\rho} \). For the MCPE, the analysis is somewhat more complicated and the exchange rate now takes on more meaning. For example, if we consider the case where the small MCPE is subjected to external inflation and a change in the terms of trade (e.g. \( \hat{P}^*_x = 0 \), \( \hat{P}^*_m > 0 \) and assuming the rate of inflation is identical for both A and B goods where we have A and B imports and exports and also non-traded goods) we have \( \hat{P}^*_{Am} = \hat{P}^*_{Bm} > 0 \), \( \hat{P}^*_x = \hat{P}^*_m = 0 \), \( \hat{P}^*_x = \hat{P}^*_m = 0 \text{ and } \hat{P}^*_m > 0 \), where subscript NT refers to non-traded goods.

From these it can be shown that \( \frac{dB^*_m}{dP^*_m} > 0 \) according to a rather complicated expression involving the measures of overvaluation (as) of exports and imports of both A and B goods, the initial trade values evaluated in both domestic and foreign currency prices and several cross and own price elasticities of export supply and import demand. Nonetheless Wolf [241] [239] shows that the MCPE can in theory prevent
external inflation from effecting the domestic price level by revaluing its currency in proportion to the rate of external inflation, or if worse comes to worse emulate the standard CPE, with complete price equalization and direct controls. In fact, there are several reasons why a MCPE may not choose to devalue, from domestic monopoly power to constraints arising from trading in two different markets: dollar and ruble.

Overall, Wolf's analysis [241] [239] [238] makes clear the types of responses possible and the effects of these responses in a detailed and concise manner. However it is difficult to ascertain the likelihood of any particular response or the indirect effects on individual markets from his analysis. For this a complete macroeconomic model is needed.
A complete model of a CPE is constructed by Portes [172] and respecified in Portes [171]. In attempting to explicitly model the disequilibrium aspects of the traditional CPE, Portes builds upon the work of Barro and Grossman [16], Benassy [19] and Dreze [55]. (He fails to recognize the fountainhead, Keynes [118], and the work of Clower [44], Patinkin [164] and Leijonhufoud [129] though.) The model as developed by Portes suffers from misspecification and does not present a realistic view of the workings of the CPE.

Portes recognizes the important distinction between household money and enterprise deposits but later ignores the distinction between the two. In the model there are two sectors: households and planner-enterprises, and three commodities: consumer goods, labor and money. Households maximize a utility function which is a function of current and future consumption and leisure subject to a budget constraint. All prices are fixed and despite strong evidence to the contrary (see Rocznik Statystyczny [185]) Portes assumes (for simplicity?) that 1) there are no transfers from the government sector to the household sector, 2) there are no taxes on households (transfers from the household sector to the government sector) and 3) households receive no bonus income. (These departures from reality are reconciled in the model of the hypothetical MCPE developed in Chapter 4). As a result of the maximization of this utility function the demand for consumer goods and supply of labor are derived
allowing for potential excess demand in either market. The demand for money balances is ignored.

Planner-enterprises maximize a utility function which depends upon the level of consumer goods produced and the level of government expenditures. Both have positive marginal utilities yet it is not apparent why planners, as a practical matter, would desire to maximize government expenditures. Nonetheless this utility function is maximized subject to: 1) a production function in which output is a function of labor and an initial stock of capital (yet there are only three goods and no description of a capital accumulation process), 2) balance equations which specify the amount of consumer goods and labor exchanged as the amount demanded and supplied, respectively, 3) an inventory accumulation function and 4) an aggregate balance equation. From this a supply of consumer goods and demand for labor function are derived. Portes suggests that the planner-enterprise's demand for labor is not effected by what happens on the goods market and thus we should not be overly concerned with rationing schemes to alleviate an excess supply of goods. However, Garvey[81] points out that enterprise deposits for the hiring of additional labor may not be released if there is excess supply of that enterprise's output. Thus planners and enterprises alike may be interested in what is happening in the goods market. Portes also assumes that all profits from production are taxed away by the state and as a result
enterprises never hold money balances. (This is presumably for simplicity because it is clearly contrary to fact. See Horwitz [106] Nuti [162] and others.)

An additional criticism of Portes' model is in the definition of money. The money supply appears as fully endogenous and automatically adjusts to equal the demand for money. Although he recognizes the important difference between the two types of money he then ignores them. The supply of household money balances is defined as the difference between government expenditures (on goods) and taxes (presumably on enterprise profits). All of these transactions take place in the form of enterprise deposit transfers. The only transactions involving cash involve households as one transactor. Yet as the model is specified there is actually no supply of household cash; the money supply is defined in terms of enterprise deposits. A definitional problem arises because Portes earlier assumes that enterprises hold no enterprise deposits, but the entire money supply is in the form of enterprise deposits which only enterprises hold.

Although the model clearly suffers from a misspecification of the theoretical foundations, the intent of the model is simply to serve as a basis for empirical examination of the CPE macro-economy. There is a brief discussion of estimation problems but the estimation of some of the particular demand functions takes place in other papers (Portes and
Winter [174][175][176] and is described here as "reasonably
good" despite a limited number of observations and problems
of simultaneity and aggregation. From Portes' theoretical
formulations a reasonable conceptual framework emerges. Many
of his thoughts are expanded upon in Chapters 4 and 5 as
the hypothetical MCPE model is developed.

In an extension of this model Portes develops an open
economy model [161] to examine the internal-external balance
conflict. The model is basically the same as the closed
economy, and therefore suffers from the same misspecification.
The production function is specified as a fixed coefficient
production function in which output is a function of value
added or imports. There is no explanation as to why this
type of production function is chosen or the importance of
the arguments of the function. The model as developed
parallels the model developed by Findlay and Rodriguez [74]
which examines the impact of macroeconomic policy under
flexible exchange rates in a market type economy. Supply and
demand functions are derived in the same manner as in the
closed economy model but in the production sector planner-
enterprises are also constrained by a balance of payments
target. Aggregate balance is then defined as external
balance: equating actual trade with planned trade; and
internal balance: equating the supply of consumer goods to
the demand. The policy instruments which are available to
the central planners in the model are the wage rate, the
level of exports and the level of government expenditures.
There is already much to argue with. Portes' policy targets ignore several of what I consider important policy goals. For example he completely neglects both full employment and price stability simply assuming these are completely dictated by planners. At the least one should consider how planners attempt to reach these goals. Also, his arguments are for a CPE. For a MCPE the problems of price stability and full employment must be treated explicitly as they are in Chapters 4 and 5 below. Taking equilibrium on the consumer goods market as the internal balance goal also neglects very important characteristics of a CPE. Capital and intermediate inputs make up a large part of any economy. In most CPEs they also make up a large part of foreign trade. One must consider these commodities to realistically evaluate the internal-external balance trade-offs in a CPE.

In a comment on Portes' paper, Holzman [102] further criticizes this model. His basic remarks, which seem generally reasonable are: (1) Portes' model does not adequately illustrate the effects of changes in government expenditures (g) and exports (e), two of the policy variables. This is in part due to the necessarily brief exposition. (2) the CC curve (a locus of equilibrium points for consumer goods) in Portes' model reflects equilibria brought about by market forces in the consumer goods market. The BB curve does not, however, represent an equilibrium brought about by market forces since it is centrally planned. Exports (e) is one part of the balance of payments target and changes in e
have an impact upon the economy and trade (perhaps in non-planned sectors) which are not considered in the model. (3) The real wage \( w \) is a control variable which influences the labor supply and then the demand for consumer goods. It is doubtful however, if there is persistent excess demand for consumer goods, that the real wage would exert much influence in the consumer goods market. (4) With respect to external balance, Portes chose exports as a control variable. Holzman asks why not imports as well? It is just as likely that planners control imports and perhaps even more effectively. Although planners may control real flows of exports and imports, Portes (and Holzman) neglect the problems associated with monetary flows and the influence of world prices. The monetary sector as a whole is not treated in Portes' model. (5) Lastly, Holzman finds difficulty in accepting equilibrium in the consumer goods market as the definition of internal balance, especially after Portes in this paper admits that the consumer goods market is probably adjusted to the producer goods market. It would have been more realistic and interesting to have a "YY" curve (a locus of equilibrium points for aggregate output). Then "one could . . . demonstrate how \([w, \text{ the real wage and exports } e]\) might be manipulated to minimize though not eliminate the contradictions among objectives." 8 It is apparent that Portes' work contains several flaws in the specification of CPE behavior but it does represent a useful first step and contains many novel concepts.
Brada [29], continuing along similar lines, attempts to develop a disequilibrium model as well, in the hope of addressing some trade-related problems. Brada also emphasizes the fact the CPEs experience considerable if not continual disequilibrium and that the role of money in a CPE is significantly different from a MTE. His model explicitly considers the two types of money: enterprise deposits, and household cash. It is specified as consisting of four markets: labor, household cash, enterprise deposits, and goods.

In the labor market the supply of labor is specified as a function of the real wage rate, real household wealth and the excess demand for household cash. Brada assumes that an increase in the real wage will reduce the quantity of labor supplied because households have excess holdings of cash and are unable to realize their desired level of consumption. That is, rather than increasing their cash balances or savings, individuals will work less. This seems a rather strong assumption and should be stated as a testable hypothesis, especially since Montias [153] has observed that "there were valuable opportunities to look forward to and to save for, which caused farmers and self employed persons to build up their cash hoards and their savings deposits..." during the inflationary experience of Poland in 1956, when wages rose rapidly. Further, Barro and Grossman [14] suggest that when households cannot achieve their desired levels of
consumption, their optimal response involves not only a reduction in the supply of labor but also an increase in the demand for money. As a result increases in the real wage may not bring about an overall contraction in the supply of labor. In fact in the Barro Grossman model in this case the real wage has no impact.

Notably absent in this market is a demand for labor equation. This may be due to the fact that Brada applies Walras' law and drops out the labor market at a later stage. Nonetheless, a complete model should include the specification of labor demand, a fortiori because one of the few real effects of an exogenous increase in the price of imports, if they are producer goods, is the possible substitution of other factor inputs, including labor, for the higher priced imports (a la Holzman's bottleneck multiplier). In the consumer goods market the demand for consumer goods is specified as a function of disposable income. Due to suppressed inflation Brada suggests that the response to changes in disposable income is assymmetric. That is, an increase in disposable income will yield an equal increase in desired consumption (since it is assumed households have an excess stock of cash). A decrease in disposable income will have no effect on the desired level of consumption since households can run down their excess stock of cash. This may be true within a certain range but certainly large enough increases in disposable income would yield increases in cash holdings.
(and a marginal propensity to consume not equal to one) and large enough decreases in income should lead to a reduction in consumption (and a marginal propensity to consume not equal to zero).

This is crucially dependent on the expectations of households with respect to the length of the constraint on consumption. Brada implicitly assumes that households expect the constraint to prevail forever. He does not, however, pursue this point. In the market for household cash, the demand for cash consists of two components: a demand for liquidity, which is a function of real household wealth, and a transaction demand. Brada emphasizes that the transactions demand is a function of realized current consumption, not desired consumption. This arises due to the constraints on the consumer goods market. He ignores what Clower [44] has called the dual decision making process, that households make both decisions simultaneously.

In the market for enterprise deposits Brada assumes that the firms' needs for wages and funds for the purchase of inputs is met automatically and it is not possible for these firms to use the funds for anything else. The supply and demand for enterprise deposits for these purposes nets out. The remaining source of demand is for funds to finance above-plan investment and inventories. This is made a function of planned as well as unplanned investment since there are some "starting up costs" not funded for planned investment as well as all of the unplanned investment. The assumption that the
demand for funds for the purchase of intermediate inputs is always met may be rather strong. Few planners consciously allot money to firms specifically to hire "tolkacchý," the "expediters" which seek out scarce inputs. Further the premiums that must be paid for these inputs on "brown" or "pink" markets are not usually planned. The workings of the enterprise deposit market should be examined more closely.

In both money markets the supply of cash and enterprise deposits are specified as exogenous. Wolf's analysis, however indicates that changes in the money supply may in some cases be the result of policy responses to external disturbances. Foreign trade-induced changes in the money supply should be merged into the macroeconomic model itself (however, we should not assume the money supply changes immediately to meet money demand, as Portes does). In Brada's model total output available for domestic consumption is the sum of domestically produced final goods (Y) and imported goods (M^f). Y is specified as a function of labor and imports and exports of intermediate goods. To close the model demand for final goods is specified as the sum of the demand for consumer goods, investment goods and export of final goods.

Brada then applies Walras' law, eliminates the labor market, and solves for various multipliers. Although I feel the model suffers from several questionable assumptions leading to misspecification of the behavioral relationships
in a CPE, it is still quite useful. It was the first attempt to introduce both the two-money system and disequilibrium nature of a CPE into a model to examine foreign trade adjustment. Let us now turn to the Eastern literature.

3.2 The Eastern Literature and Econometric Models.

Macroeconomic problems of CPEs have not entirely been ignored in the East and models, particularly econometric models,\(^9\) have been constructed for several purposes.\(^{10,11}\) In the case of Poland there have been four complete macroeconomic models and three partial or sectoral models.\(^{12}\) The four complete macroeconometric models shall be discussed briefly in turn.

The first model, published in 1968, by Z. Pawlowski, et al. \(^{[165]}\) was constructed primarily to demonstrate econometric methods and verify their applicability to the Polish economy. The model, twelve equations and five identities, was estimated using OLS and 2SLS with data from the years 1950-1964. The foreign trade sector played a minimal role. Since the authors' primary intent was to show that econometric techniques were applicable to the Polish economy, trends of endogenous variables were analyzed and arguments for further attempts at construction of econometric models were presented.
Growing out of these initial efforts was the work of Maciejewski and Zajchowski, the KP-1 [143], and KP-2[141], models, and Welfe, the W - 1 model [232]. The KP - 1 model was primarily employed for simulations of the national economy for the five year plan corresponding to 1971-75. This model suffered from several deficiencies. For example aggregation was not uniform as there were equations explaining total industrial output on the one hand versus the demand for drinks and tobacco on the other. Further there was no direct linkage between several sectors. For example, an increase in agricultural output, ceteris paribus, did not imply an increase in national income which would normally be expected. There was also a lack of contemporaneous feedback in the model. One major criticism is the selection of exogenous variables and policy instruments. Simulations were run changing such variables as labor productivity and capital efficiency which are not generally policy instruments. Rather than describe this model more fully I shall turn to the KP - 2 model, which was developed to replace KP - 1.

In the KP - 2 model policy instruments for the simulations were more carefully chosen, such as: the distribution of capital among sectors, and the inter-branch wage and price structures. From our point of view it is interesting to note that the balance of foreign trade is a policy instrument. The planners can accept or reject particular levels of this balance and allow for its affects on national income dis-
tributed. Also world prices do not enter the equations for either imports or exports. Although the model was specified more carefully, with simulation in mind, there are still other difficulties, primarily in estimation technique. The model consists of 190 endogenous and 130 pre-determined variables. There are 121 stochastic equations and 69 identities estimated by 2SLS on a data base of 13 years (1960-1972). The problem is obviously one of having enough observations. Although the actual data is not presented the authors allude to yearly observations, which would severely limit the accuracy of the estimators. Nonetheless neither the KP - 1 or KP - 2 models address the problems we are interested in: questions concerning exogenous disturbances, especially those external to the domestic economy.

The fourth and most recent model is Welfe's W - 1. It is also primarily concerned with tracing the flow of resources through the domestic economy. The model consists of over 200 equations, the structure of which is determined by the material product system of national accounts. The 200 equations are divided into eleven subsystems which are partially bloc recursive. These subsystems are estimated using OLS and 2SLS with data from 1950-1969 for the main aggregates, 1955-1969 for disaggregation of industries and investment outlays, and 1960-1969 for the remaining. The model has a foreign trade sector but neither foreign nor domestic prices enter any of the import or export equations.
Thus the model has little to say about the effects of external shocks on the foreign sector alone, much less the rest of the domestic economy. Although the model is currently being revised it is interesting to note that neither this nor any of the earlier models dealt extensively with the foreign trade sector. In fact, in general "econometric model builders have . . . failed to adequately articulate the relationship between fluctuations in foreign prices, domestic prices and the foreign exchange rate,"¹³ not just in models of CPEs but in market economies as well.

These models are currently the only complete models of Poland and they do not really address the questions we would like to consider. Since these models have, for our purposes, very ill-defined foreign sectors the effects on the domestic economy can not be deduced. As a result we must proceed along other lines in a search for a more useful macroeconomic model of Poland.

3.3 Concluding Remarks

From our review of the literature we see that: (1) the research by Holzman, dealing with a conventional CPE, emphasized the real channels of adjustment and their differences from MTE adjustment mechanisms, (2) Wolf introduced the concept of the MCPE, clarified the role of the PE mechanism, and traced the impact of exogenous disturbances, with emphasis on the monetary channels, the basic policy options
(including exchange rate policy in MCPEs) and the initial direct effects of each option on the trade balance and internal balance, (3) both Brada and Portes attempt to model a CPE, introducing conceptual innovations, but fail to specify the behavioral relationships realistically, (4) models of the Polish economy (econometric) are primitive and do not address the questions we are interested in.

Thus the problem is clear: incorporate both the potential real and monetary adjustments of a MCPE in a model allowing for the peculiar disequilibrium and dual money characteristics found in the East European economies in such a manner that behavioral relationships can be verified via econometric techniques. A closed economy model is developed in the next two chapters and Chapter 6 considers the problems of an open economy.
Notes to Chapter 3

(1) Holzman [101].

(2) Wolf [238] also shows that Ames [8] made an error when he suggested that if $A = 0$ then $dA/dR$ necessarily is non-zero. Wolf writes $A = (V_m - V_x) + R(V^* - V^*)$ from which it can be seen $dA/dR$ depends on $B_x^* = V_m^* - V^*$, not $A$ itself. This verifies Pryor's [180] earlier work.

(3) Holzman [101], Chapter 5.

(4) See Wolf [238] for details.

(5) He does, however, assume equilibrium in the enterprise deposit market and omits it from his model. The equilibrium aspect may be reasonable but eliminating the market from the model entirely may not be.

(6) See the discussion of Brada's model [27] below.

(7) This is my assumption. Portes leaves unclear whether this set of equations is only for the case when the plan is fulfilled or not. He mentioned earlier that $X$ is exogenous if the plan is not met; the equation $X = (X^P, y, Z)$ makes $x$ an endogenous variable and I assume he is now speaking of when the plan is fulfilled. Portes is not clear on this matter and perhaps he did not mean to label $X$ as exogenous earlier.

(8) Holzman [101].
(9) See Klein [120] for a discussion of the applicability of econometrics to socialist economies.

(10) See Sujan and Kolek [208] and Shapiro and Halabuk [197] for surveys of several models of various other CPEs. In general they are very similar (if not identical) to the models of Poland discussed above.

(11) There have also been econometric models built by Western economists. For example: King's [119] model of Czechoslovakia and more recently Green and Higgins' [86] model of the Soviet Union. Although the models are not concerned directly with foreign trade, they do provide insight into the formulation and estimation of large models.

(12) The complete models which will be discussed are Pawlowski's, the KP-1, KP-2 and W-1 models (the W-1 model is currently being revised). The partial models are one of the financial sectors by N. Lapinska-Sobczak, a model of consumption by Zhkonski and Opara, and a model of intra-CMEA trade by Maciejewski and Piascynski. See [197].

(13) Shapiro and Halabuk [197], p. 541.
Chapter 4: An Equilibrium Model of a Closed Modified Centrally Planned Economy

4.0 Introduction

In this chapter a model of the hypothetical modified centrally planned economy is developed incorporating the known characteristics of the Polish economy. However, due to the nature of the Polish economy, the limited amount of information about the true inner workings and its complexity, it will be necessary to make many simplifying assumptions. The analysis below often compares the actors, households, enterprises and the state, of the hypothetical MCPE with the actors of the traditional market type economy. Any comparisons with the Polish economy itself are of course limited by the extent that the hypothetical MCPE model actually describes the Polish economy. This chapter considers a closed economy under equilibrium, market clearing conditions for purposes of simplicity and clarity. In the following chapter we shall consider a closed economy model under the more realistic situation of excess demand, and non-market clearing conditions. In both chapters we consider first the behavior of households, second the behavior of enterprises, third the government and planners behavior, and then we consider the effects of several exogenous disturbances.
4.1 Households

In the modified centrally planned economy we assume that households attempt to maximize utility in each time period. In their behavior they act no different than the household in a market type economy. \(^{(1)}\) They do, however, act within different institutional bounds. Specifically, households attempt to maximize a momentary utility function:

\[
(10) \quad u(t) = u[c(t), \ell(t), g_p(t)] \quad \text{where the signs under the variables refer to the signs of the partial derivatives of } \ u \ \text{with respect to those variables. Government activity in the household sector, the provision of public services, may be thought of as having two components. The first is that type of public service which is offered on a market by enterprises which are subsidized heavily by the government. They sell their output at what may be less than equilibrium prices. For example, public transportation, state catering establishments and so forth, fall into this category. The demand for these services is included in } c(t). \ \text{The second component includes, for example, education and certain medical services which are provided at no charge } (g_p(t)). \ \text{We shall assume that the provision of these services has a positive impact upon total utility.}

Households also attempt to maximize total utility over their planning horizon, which we assume to be } N \ \text{periods long} \ (0 \leq t \leq N)
(11) \[ U = \int_0^N u(t) \, dt \]

where there are \( N' \) working years and \( N - N' \) retirement years for each household.

Wages and prices are taken as given. Households are able to sell the quantity of labor which they supply and buy the amount of commodities they demand, so that:

\[ c = c^d \quad \text{and} \quad \ell = \ell^s; \]

where the superscripts refer to the quantities demanded and supplied. Households keep money balances in cash or in savings accounts. Although savings accounts in Poland's National Savings Bank earn a low nominal rate of interest (usually 3 per cent or less)\(^{(2)}\) we shall assume that this return is so low as to have no impact on household, enterprise, or government behavior.

Household disposable income consists of wage income \( \ell^w \), plus bonuses (b) minus direct personal taxes (T). Households expect some positive amount of bonuses to be paid by the firm and their individual share depends upon income: as income earned through the provision of labor services increases, bonuses increase as well. Thus we specify bonuses as

(12) \[ b = b\left(\frac{\ell^w}{\ell^p}\right). \]

We also assume that taxes paid by consumers are dependent
upon income. In addition, however, as government services provided to consumers increase \((\delta g_p > 0)\), taxes increase as well. Thus we specify taxes as:

\[
T = T\left(\frac{W \cdot \ell}{p}, \ g_p\right).
\]

For retired workers both \(b\) and \(T\) are zero.

Let \(S\) be the rate of change of real money holdings or the difference between real disposable income and consumption:

\[
S = \frac{1}{p} \left(\frac{dM^d}{dt}\right) = \frac{m^d}{p} = \frac{W \cdot \ell S}{p} + (b - T) - c^d
\]

where \(M^d\) is the stock demand for real money balances and \(m^d = \frac{dM^d}{dt}\) is the flow demand for money balances. When the representative household determines its desired level of consumption and employment the rate of change of money balances is instantaneously determined. Then the household's real asset holdings at any time \(t\) is

\[
M(t) = M(0) + \int_{0}^{t} \frac{m^d}{p} \ dt.
\]

If no utility accrues to households after time \(N\) the intertemporal maximization of household utility implies the complete exhaustion of assets at time \(t = N\). The household's pattern of consumption and employment must then obey the household's budget constraint:

\[
M(N) = M(0) + \int_{0}^{N} (b - T) + \frac{W \cdot \ell S(t)}{p} \ dt - \int_{0}^{N} c^d(t) dt = 0
\]
In addition, households are constrained by their initial stock of assets, or initial wealth, when no income is earned from employment:

\[ \Omega = \frac{M(0)}{p} \quad \text{for} \quad (N < t \leq N). \quad (3) \]

Note that the asset exhaustion condition, (16), is a simplification. It is not clear whether households choose and/or desire to exhaust all of their assets at the time of their death. However, due to the rather strict control of bequests and high inheritance taxes in Poland in the past it is clear that households do not attempt to hold large stocks of wealth at time \( N \). We assume that households attempt to exhaust this stock for simplicity.

The demand for consumption goods and the supply of labor services depend upon (1) the specification of the momentary utility function, (2) the additive nature of total lifetime utility, (3) the length of the working and planning (lifetime) horizons, \( N' \) and \( N \), (4) the relative price of leisure and consumption \( \frac{W}{p} \) and, (5) non-wage wealth, \( \Omega \).

Given \( N \), \( \frac{W}{p} \), and \( \omega \) the maximization of (10) subject to (16), (substituting (12) and (13) for \( b \) and \( T \) yields a consumer goods demand function and a labor services supply function. These may be written as:

\[ c^d = c^d(\frac{W}{p}, \Omega, e_p), \quad \text{and} \quad + + (\pm) \quad (18) \]
\[ \lambda^S = \lambda^S(\frac{w}{p}, \Omega, \varepsilon_p), \]
\[ +, -, + \]

Again the signs below the variables indicate the signs of the partial derivatives and are explained below.

The maximization problem results in levels of consumption, \( c^d \), and work, \( \lambda^S \), which satisfy the first and second order conditions as indicated in Appendix B for each period \( 0 \leq t \leq N^* \). If there is no change in the exogenous variables these values will be constant for all \( N^* \) periods. If we perform the same maximization for \( N^* < t \leq N \), a period in which the only difference is \( \lambda^S = 0 \), due to retirement, the solution yields a level of consumption demand in each period which is less than \( c^d(t), 0 \leq t \leq N^* \), since the budget constraint has, in effect, shifted.\(^{(4)}\)

This is similar to the traditional life cycle theory of consumer behavior: consumers borrow to purchase a high level of consumer goods early in their life, gradually repay their outstanding debt and accumulate net savings, then dissave during retirement. In Poland however, consumer debt is a very small portion of total debt (less than 1.6% in 1973\(^{(5)}\)) and thus in our hypothetical MCPE we would not expect net borrowing by households. We would expect savings for individual households to be positive during the working period and negative during retirement years.

The signs of the partial derivatives of equations (18) and (19) and the conditions which guarantee these
signs if the partials take on both negative and positive values are derived in Appendix B. In general the signs with respect to \( \frac{w}{p} \) depend upon the tax and bonus scheme which prevails in the economy. In the case in which taxes are progressive (the marginal tax rate increases as income increases) and in which bonuses are regressive (the marginal bonus rate decreases as income increases) conditions 261, 262, and 264 outline the sizes of the marginal changes in the tax and bonus rates which guarantee

\[
\frac{\partial c}{\partial w} \frac{d}{w/p} > 0, \quad \frac{\partial s}{\partial w} \frac{d}{w/p} > 0.
\]

In the simple case in which taxes and bonuses are independent of marginal income, then the term

\[A_2 = \left[ b \frac{w}{p}, \frac{w}{p}, T \frac{w}{p}, \frac{w}{p}, \right],\]

which describes the rates of change of the bonus and tax rates with respect to changes in income would be zero. (The subscripts \( \frac{w}{p} \), \( \frac{w}{p} \) indicate the second derivative with respect to \( \frac{w}{p} \).) Conditions 261, 262, and 264 are satisfied in this case and from equation 260 we have:

\[(260) \quad \frac{\partial c}{\partial w} = \frac{1}{|D_2|} (A_2 \cdot \frac{w}{p} \lambda) > 0, \quad \text{and from 263 we have:}\]

\[(263) \quad \frac{\partial s}{\partial w} = \frac{1}{|D_2|} \cdot \lambda \cdot A_1 > 0;\]

where \( A_1 = [b \frac{w}{p} - T \frac{w}{p} + 1] > 0, \) and may be termed the "net marginal earnings rate," since for each additional unit of labor provided the household receives the wage rate
plus a bonus minus taxes. Thus when $A_2 = 0$, or when $A_2 \neq 0$ but conditions 261, 262 and 264 are met, households unambiguously demand more consumer goods and offer more labor services, as we would normally expect. That is, changes in $\frac{w}{p}$ involve an income effect and a substitution effect. An increase in the real wage causes an increase in real income and a resulting increase in demand for consumer goods ($c^d$) and decrease in the supply of labor ($L^s$). At the same time, with an increase in the real wage the cost of leisure increases, causing the demand for consumer goods to increase and the supply of labor to increase. As a result of these two effects an increase in the real wage causes an increase in demand for consumer goods. With respect to the supply of labor, we shall assume the substitution effect is greater than the income effect in the relevant range so an increase in the real wage increases the amount of labor supplied. It may be possible however, if the conditions of 261, 262, and 264 are not met, that the tax and bonus system is structured such that the household will respond perversely to changes in the real wage, working less and demanding fewer consumer goods as real wages increase. We assume that this is not the case.

Changes in the stock of money balances, $\frac{M(0)}{p}$, involve a wealth effect which influences $c^d$ and $L^s$ only through its effect on $\Omega$. Above we stated that $\frac{M(0)}{p} = \Omega$, which
implicitly assumes there is no other form of nonwage income. We could also consider types of income which are independent of wage income, such as retirement benefits or welfare schemes. These however, will not change the basic results with respect to changes in \( \Omega \). Thus an increase in \( \frac{M(0)}{P} \) increases \( \Omega \). The households' response to changes in real wealth are indicated by equations 269 and 270:

\[
\frac{\partial c}{\partial \omega} = \left\lfloor D_3 \right\rfloor (-1) \left( U_{kk} + \lambda \left( \frac{W}{P} \right)^2 A_2 \right) > 0 \text{ if } A_2 \leq 0.
\]

\[
\frac{\partial l}{\partial \omega} = \frac{1}{\left\lfloor D_3 \right\rfloor} \left( U_{cc} \frac{W}{P} A_1 \right) < 0
\]

These responses are what we would expect since both consumption and leisure are normal goods. An increase in wealth increases the demand for consumer goods, and decreases the supply of labor services.

The provision of public services by the government also brings the household utility. As the amount of public services provided increases the household provides more labor services as indicated by equation 254:

\[
\frac{\partial \lambda}{\partial g_p} = \frac{1}{\left\lfloor D_1 \right\rfloor} \left( -U_{cc} T g_p \frac{W}{P} A_1 + \lambda \frac{W}{P} T w_p , g_p \right) > 0
\]

This is because government services are related to taxes (equation 13). With the increase in public services comes an increase in taxes. Households choose to offer more labor services in order to maintain their real disposable income. It is clear from 254 that if taxes and government
services were independent \( T_{\xi_p} \) and \( T_{\xi_p} \), \( \frac{w}{p}, \xi_p \) were both zero) then there would be no impact upon the amount of labor services offered by changes in the level of public services.

If the response of households is to increase the labor supply by an amount large enough to increase disposable income then the demand for consumer goods would also increase. On the other hand, if households increase their labor services by a lesser amount, maintaining their current real disposable income, they may simply substitute the amount of government services provided for consumption goods which they would have purchased. That is, they choose, instead of more total consumption, to maintain or possibly increase a given level of leisure. Equation 252 indicates that any change in the demand for consumer goods stems from a change in real disposable income and may be positive or negative:

\[
\frac{3c}{3\xi_p} = \frac{1}{D_{\xi_p}} \left[ \lambda \left( \frac{w}{p} \right)^2 T_{\xi_p} \cdot A_1 - T_{\xi_p} \left[ U_{\xi_p} + \lambda \left( \frac{w}{p} \right)^2 A_2 \right] \right]_0^0
\]

Further, from condition 253 of Appendix B, even if bonuses and taxes are exogenous \( A_2 = 0 \), as discussed above) the impact upon the demand for consumer goods may be positive or negative depending upon the marginal disutility of work. That is, the impact depends upon whether the household prefers another unit of leisure or more consumer goods as a result of the increase in public services.
Given the definition of savings, the choice of \( c^d \) and \( \lambda^s \) simultaneously determines \( \frac{m^d}{p} \); also constant for \( 0 \leq t \leq N' \), and constant but at a different level from \( N' < t < N \). Substituting the optimal values of \( c^d \) and \( \lambda^s \) from equations 18 and 19 gives the current notional real flow demand for money balances as:

\[
\frac{m^d}{p} = \frac{m^d}{p}(\Omega, \frac{w}{p}, g_p) - + \dagger
\]

where the signs under the variables are the signs of the partial derivatives. These signs may be verified by totally differentiating equation 14 as illustrated in Appendix B.

An increase in the stock of money balances, or wealth, has a negative impact upon the flow demand for money balances for two reasons. Equation 276, derived in Appendix B, illustrates these:

\[
\frac{\partial m^d}{\partial \Omega} = A_l \frac{w}{p} \frac{\partial \lambda}{\partial \Omega} - \frac{\partial c}{\partial \Omega}.
\]

First, if leisure is a normal good households choose to consume more of it and work less as a result of the increase in nonwage income, wealth. This is the first term on the right hand side of equation 276 and it is negative. Second, households also choose to consume more in both working and retirement years as their wealth increases. As more consumer goods are purchased out of any given level of disposable income less of that income is saved. The net effect as equation 276 illustrates, is
that \( \frac{\partial m_d}{\partial W/p} < 0 \). An increase in the level of wealth brings about a lower level of saving during the working years since both consumption expenditures increase and labor services offered decrease.

The impact of changes in the real wage can also be decomposed into two effects. From Appendix B, equation 271, we have:

\[
(271) \quad \frac{\partial m_d}{\partial W/p} = (b_w - T_w + l) \left( \frac{w}{p} \cdot \frac{\partial l}{\partial W/p} + \lambda \right) - \frac{\partial c}{\partial W/p}
\]

There is an increase in net income as a result of an increase in the real wage, the first term on the right hand side. Second there is a change in the demand for consumer goods as the real wage increases. If the tax and bonus scheme meets the qualifications discussed above, then \( \frac{\partial c}{\partial W/p} > 0 \). Now, if we assume that the marginal propensity to consume is less than one, out of each additional unit of income the household consumes only part of it and there is no borrowing, the first effect, the increase in income, will be greater than the second effect, the increase in consumption. Thus the net impact of an increase in the real wage is to increase the flow demand for money balances. For retired households \( \lambda^S = 0 \) so there is no possibility of substituting work for leisure, no increase in income, and no impact upon the flow demand for money.
The household also responds to changes in government services in two ways. From Appendix B, equation 274 we have:

\[
\frac{\partial m^d}{\partial g_p} = A_1 \frac{w}{p} \frac{\partial \lambda}{\partial g_p} - \frac{\partial c}{\partial g_p}
\]

As a result of an increase in public services households increase their labor supply. The first term on the right hand side of 274 represents the increase in net income which results. Households may also increase or decrease their demand for consumer goods (as discussed above). If they decrease their demand for consumer goods \( \frac{\partial m^d}{\partial g_p} \) is clearly positive. If households increase their demand for consumer goods \( \frac{\partial m^d}{\partial g_p} \) depends upon which of the two effects is greater, the increase in income or the increase in demand for consumer goods.

In summary the households' behavior with respect to the amount of labor services offered, the demand for consumer goods, and the demand for money balances can be described by:

\[
c^d = c^d \left( \frac{w}{p}, \Omega, g_p \right)
\]

\[
\lambda^s = \lambda^s \left( \frac{w}{p}, \Omega, g_p \right)
\]

\[
m^d = m^d \left( \frac{w}{p}, \Omega, g_p \right)
\]
These functions are not significantly different than those that we would derive for households in a market type economy. The only difference is the institutional aspects connected with savings in the MCPE and perhaps a higher level of government services.

4.2 Enterprises

Enterprises in the hypothetical modified centrally planned economy are guided by means of three groups of control parameters set by the central planners.\(^6\) Although Hewett suggests that planners' behavior should be modelled more explicitly when one models a centrally planned economy, I shall not address their behavior. We shall ignore the actual planning process and the methods of arriving at plan parameter values. We shall assume that enterprises take plan parameter values as given and act accordingly within the plan constraints.

The first group of control parameters carries information about the level of economic activity in general and relative scarcities in various markets. These parameters are usually set formally by the planners at the Central Planning Board (or in some cases the ministry dealing with that particular product). They include such parameters as foreign exchange coefficients, rates of amortization and the rate of interest.\(^7\) Others in this group are prices and wages. We shall assume that enterprises take
prices as given, either determined by the central planners or by market forces, (8) and that, in this chapter, these prices are equilibrium prices. (9)

The so-called "general supporting parameters" make up the second group. (10) These parameters are designed to redirect economic activity and are the primary means of government intervention. They include: (1) "subject subsidies" offered to enterprises for the production of goods which would normally be rejected by enterprise managers as unprofitable, (2) price equalization subsidies and taxes on exports and imports, and (3) export taxes and import tariffs. In addition, as Muti [152] notes, planners evaluate enterprise performance on the basis of profitability and value added. In doing so the central planners assign a relative importance to each and this importance, or weight, may vary across industries or products according to the specific goals of the central planners. Thus a fourth control parameter in this group is the weight assigned to value added (relative to profits) in the enterprise objective function. The general supporting parameters are often product specific, whereas those in the first group above are industry or economy wide.

The third group of control parameters is simply the administrative system of direct commands. Obligatory targets are set for the production of certain products. Enterprises participate in a planning process similar to
that of the traditional, classical CPE and receive orders for obligatory deliveries to the state sector. These goods are then redistributed to other enterprises in the form of low cost capital or intermediate inputs, they are sold on the consumer goods markets at artificially low prices (in the interest of maintaining a certain income distribution) or they may be used for defense purposes. (11)

The distinction between types of planned commodities should also be made. All commodities may be planned. For many commodities the quantity of the output to be produced is planned and the price of the good is controlled. These commodities, usually strategic items such as fuels, raw materials, and so forth are termed "A-goods" for simplicity. These goods, being more strategic, are planned in some detail and planners provide as much incentive as possible in terms of prices, subsidies, and emphasis on value added rather than profits, say, for the enterprise to produce exactly the planned amounts. Other goods, less strategic, are planned as well, but in less detail. Planners have less interest in fulfilling exact output levels for any one of these goods and they are termed "B-goods" for simplicity. Their interest in planning B-type goods is due to their desire for macro-economic balance. Therefore they do not see a need for rigid planning or control over these goods. In general then, although they may be planned, the quantity of B-goods produced and the price of B-goods are both flexible.
Even though both A- and B-type goods are planned these goods are not usually controlled in the same sense that goods are controlled in the classical CPE. In the classical CPE planners may be viewed as giving enterprises a plan for output and inputs which must be fulfilled regardless of costs or profits. These goods are then directed throughout the economy generally without the use of markets. In the MCPE however planners attempt to control economic activity via the control parameters outlined above. Although "the plan has the character of a decision [and] it is obligatory, its realization is ensured by directive means and by other means, namely economic instruments of economic policy."(12) The enterprise in the MCPE then has an objective function which includes both profits and value added and the enterprise responds to the control parameters which planners determine.(13) In addition trade takes place on organized markets.

At present we shall consider a closed economy, abstracting completely from the foreign sector. Thus we shall ignore for the moment price equalization subsidies and taxes, export taxes and import tariffs, and foreign exchange coefficients. We shall also assume that capital is purchased in each period and consumed entirely in that period,(14) therefore rates of amortization do not affect enterprise decisions in this model.
Enterprises may be characterized by the type of commodities they produce but their behavior with respect to production decisions is basically the same. There are two basic groups: (1) enterprises which produce those commodities which have planned and fixed prices and quantities, termed A goods above \((\overline{P}_A, Q_A)\), and (2) enterprises which produce commodities which are not controlled at all, with price and quantity determined on the market, termed "B goods" above \((P_B, Q_B)\).\(^{15}\)

We assume also that state purchases from the enterprise sector, or the demand for goods and services by the government \(g^d\), is determined by the central planners. Similarly government subsidies \(g_s\), to enterprises are also determined within the planning sphere. Thus enterprises take both \(g^d\) and \(g_s\) as given and are assumed to be unable to influence their levels.\(^{16}\) Purchases by the government sector may be "A goods" which are completely planned or they may be "B goods" which the government purchases on the market. Of the purchases made by the government, some are consumed, \(g_D\) (such as those for defense) but most are "redistributed" in the form of public services to consumers, \(g_p\), and subject subsidies to enterprises \(g_s\).\(^{17}\)

In Poland enterprises, acting within the wage and price framework established by the central planning board, are evaluated by two major criteria. These are: (1) "net production added," roughly the same as value added (VA),\(^{18}\)
and (2) profits (Π). These criteria have evolved as a result of the continuing economic reforms and represent a movement toward microeconomic efficiency. In the early periods of economic planning and management in Poland enterprises were evaluated by their fulfillment of detailed plans for levels of inputs and output. Their success was measured to a large degree simply by the size of gross output or value added. As concern for microeconomic efficiency increased in the early 1950s the bonus system and success criteria slowly evolved to the current system. The number of targets (input and output figures) was gradually reduced, gross output was replaced as a success indicator by value added, a charge for capital services was instituted and profits became an important measure of success. Today profits and value added are the most important criteria: profits in recognition of their role in attaining micro efficiency, value added in part a remnant of the old system, and in part in hopes of maintaining high levels of employment.

Planners have also made both profits and value added play key roles in the formation of bonuses. The bonus paid to managers and additions to various funds, such as the enterprise development fund which the enterprise uses at its discretion, are a function of profits. The largest category of bonuses are paid to workers from the workers' wage fund. Additions to the workers' wage fund are a function of value added and the size of the wage fund itself.
In our simplified MCPE model we shall assume bonuses paid to workers may be written as:

\[(21) \quad b_t = \beta(\text{VA}_{t-1}) \left[ \frac{W}{P} L_t \right].\]

A certain amount of profits is paid out as bonuses. That amount, \(b_t\), depends on two factors: (1) the current wage fund, \(\frac{W}{P} L\), and (2) a coefficient, \(\beta(\text{VA}_{t-1})\), which is set by the central planners as a function of value added in the previous period. (We shall ignore the method by which planners choose the value of this coefficient."

Nuti [89] considers in some detail two alternative methods which planners in Poland use to determine the link between bonuses and value added, and Wanless [229] considers some modifications made in 1976.) If value added in period \(t-1\) increases (relative to value added in period \(t-2\)) the coefficient, \(\beta(\text{VA}_{t-1})\), increases by some prescribed amount. Bonuses are that coefficient times the current expenditures on labor, the current wage fund.\(^{(19)}\)

Enterprise managers then are induced to maximize an objective function which is a combination of profits and value added not only because they are the criteria by which the state evaluates enterprise performance but because their own bonuses are a function of profits and workers' bonuses are tied to value added.

In the simplest case, we assume that the enterprise in the hypothetical MCPE maximizes an objective function
which is a weighted sum of value added (VA) and profits (\(\Pi\)). We assume a linear function for simplicity and ease of explication. Although there are other factors which influence enterprise behavior (such as tax rates on profits and controls on the use of enterprise development funds) the role of profits and value added is the most significant. Out of profits enterprises pay bonuses (b) to workers, which are determined by equation (21). Any profits not distributed by the enterprise are retained in the enterprise account at the national bank as enterprise deposits. These deposits are used for future expenditures (primarily but not limited to investment expenditures). We assume then that the representative enterprise maximizes an objective function which may be specified as:

\[
F_t = \alpha VA_t + (1 - \alpha)\Pi_t, \quad 0 \leq t \leq N,
\]

where \(\alpha\) is the weight of value added in the enterprise objective function and is determined by the central planners \((0 < \alpha < 1)\). Enterprise managers have a strong interest in maximizing profits since their bonuses are tied directly to profits. However, since the central planners are also interested in value added they set a guideline for the relationship between profits and value added in the form of \(\alpha\). Managers will then maximize their bonuses based on profits, subject to \(\alpha\), when they maximize \(F_t\). Assuming there are only two factor inputs, the services of capital, \(k\), and labor, \(l\), we may write value added as:
\[(23) \quad VA_t = y_t^s - \frac{r}{p} k_t^d,\]

where \(y_t^s\) is the flow of total output of goods and services produced in period \(t\), and \(\frac{r}{p}\) is the real price of the capital services purchased by enterprises. Profit, \(\Pi_t\), in each period is:

\[(24) \quad \Pi_t = y_t^s - \frac{w_t^d}{p} t - \frac{r}{p} k_t^d.\]

The enterprise then maximizes

\[(25) \quad F_t = y_t^s - \frac{w_t^d}{p} t - (1 - \alpha) \frac{w_t^d}{p} c\]

over all \(N\) periods.

Production is specified by a production function which depends upon the amount of labor services \((l_t^d)\) and capital services \((k_t^d)\). We assume all inputs are consumed entirely within the period they are purchased. The production function may then be written as:

\[(26) \quad y_t^s = \phi(l_t^d, k_t^d), \quad 0 \leq t \leq N.\]

If we substitute (26) into (25) the conditions, derived in Appendix C, for a maximum (suppressing the superscripts and the time subscripts for notational simplicity) are:

\[(27) \quad \phi_{l^d} - (1 - \alpha) \frac{w}{p} = 0,\]

\[(28) \quad \phi_{k^d} - \frac{r}{p} = 0.\]

Since

\[(29) \quad \frac{\phi_{k^d}}{\phi_{l^d}} = \frac{1}{(1-\alpha)} \frac{r}{w} > \frac{r}{w}, \quad (0 < \alpha < 1),\]

the marginal rate of technical substitution for the hypothetical MCPE enterprise is greater than that for the profit
maximizing firm under perfect competition. If we have two production possibilities, one and two say, it can be shown that if \( \frac{\phi_k}{\phi_k} > \left( \frac{k}{z} \right)^2 \) then \( \left( \frac{k}{z} \right)^2 > \left( \frac{k}{z} \right)^2 \). Thus we see that, when compared to the profit maximizing firm, the hypothetical MCPE enterprise is overemploying labor. It acts as if labor costs \( (1-a) \frac{w}{P} < \frac{w}{P} \). As Nuti [162] explains:

"the use of value added as a performance indicator . . . induce(s) enterprises to use labor as a substitute for (capital) inputs even if labor productivity is lower than the wage rate."(23)

Figure 1 illustrates this and depicts the hypothetical MCPE enterprise's expansion path as upward and to the left of the expansion path for the profit maximizing firm.

![Diagram](image-url)

**Figure 1**

Expansion Paths
These conditions do not tell us how much the enterprise will produce however, since each production point must be feasible as well. The enterprise must have a minimum amount of funds available in each period, either in the form of enterprise deposits accumulated in previous periods:

\[(30) \quad E(t) = \int_{0}^{t} e_t \cdot ds,\]

where \(E\) is the stock of deposits and \(e_t = \frac{dE}{dt}\), the flow, or in the form of net revenue in the current period \((R_t - b_t + s_t)\), so that labor services and capital can be purchased and bonuses can be paid. The enterprise then faces the situation where in each period its stock of deposits, plus net revenue, must be nonnegative:

\[(31) \quad E_t + (y_t^S - \frac{w_t}{p_t} - \frac{r}{p}k_t) - b_t + s_t \geq 0\]

The distinction between "A goods" producers and "B goods" producers now plays an important role. "A goods" producers being centrally planned, receive the bulk of government subsidies and may be able to borrow at virtually no cost in order to alleviate this budget constraint. "B goods" producers on the other hand may not be able to borrow at all since enterprise credits are strictly controlled (primarily through planned nonprice rationing) and the level of government subsidies they receive is small when compared to the "A goods" sector. This does not change the qualitative results in deriving the enterprise demand or supply functions since both types of enterprises will
react in the same way to changes in either of these planners' policy instruments (\( g_s \) or the cost of borrowing funds). We must keep in mind though, that changes in these instruments will be affecting predominantly the production of A goods.

Substituting (21) into (31) the enterprise budget constraint may be rewritten as:

\[
E_t + y_t^S - (1 + \beta(VA_{t-1})) \frac{w_t}{p_t} l_t - \frac{r_k}{p_t} k_t + g_{st} \geq 0
\]

The flow of enterprise deposits in each period may be written as

\[
e_t = n_t - b_t + g_{st}, \text{ or }
\]

\[
e_{td} = y_t^S - (1 + \beta(VA_{t-1})) \frac{w_{td}}{p_t} l_t - \frac{r_{kd}}{p_t} k_t + g_{st}
\]

In Appendix C the optimum conditions for the hiring of capital and labor services in each period of a two period case are derived (equations (300-303). For simplicity and without loss of generality let us consider here a one period case, where the enterprise maximizes the objective function, (25), subject to the budget constraint, (31), which defines the feasible production set, (25). The enterprise then maximizes:

\[
L = \phi(l, k) - \frac{r_k}{p} k - (1 - \alpha) \frac{w_t}{p} l - \lambda [E + \phi(l, k) - (1 + \beta(VA_o)) l \frac{w_t}{p} - \frac{r_k}{p} k + g_s - \delta]
\]

Differentiating with respect to \( l, k, \lambda \) and \( \delta \), (noting that since value added in the previous period is fixed \( \beta(VA_o) \))
is a constant in this case), the first order conditions are:

\[ \frac{\partial L}{\partial \lambda} = \phi_{\lambda} - \frac{(1 - \alpha)W}{p} - \lambda[\phi_{\lambda} - (1 + \beta (VA_o)) \frac{W}{p}] = 0 \]  
\[ \frac{\partial L}{\partial k} = \phi_{k} - \frac{r}{p} - \lambda[\phi_{k} - \frac{r}{p}] = 0 \]  
\[ \frac{\partial L}{\partial \lambda} = -[E + \phi(\lambda, k) - (1 + \beta (VA_o)) \frac{W}{p} - \frac{r}{p} + g_s - \delta] = 0 \]  
\[ \frac{\partial L}{\partial \delta} = \lambda \leq 0 \]

From equations (36) and (37) we have:

\[ \phi_{\lambda} = \left[ \frac{(1 - \alpha) - \lambda(1 + \beta (VA_o))}{1 - \lambda} \right] \frac{W}{p} \]

and

\[ \phi_{k} = \frac{r}{p} \]

We see that the enterprise still hires the same level of capital as in the case in which the budget constraint is not binding since hiring an additional unit of capital relaxes the constraint by the amount of revenue which the output of that unit of capital brings in, \( \phi_{k} \), and tightens the constraint by the cost of that unit, \( \frac{r}{p} \). With respect to labor however, the enterprise acted as if each unit of labor cost \( (1 - \alpha) \frac{W}{p} \), when the budget constraint was not explicitly taken into account. The actual cost is the wage rate plus the bonus paid to each worker, or \( (1 + \beta (VA_o)) \frac{W}{p} \). The enterprise had no incentive to hire where the marginal product of labor equaled the actual cost of labor however.

The enterprise, when the budget constraint is taken into
account may increase or decrease the amount of labor it hires (relative to its position without taking the constraint into account), equating the marginal product of labor with the wage rate adjusted for \( \alpha, \beta(VA_o) \) and \( \lambda \). Rewriting (40) we have:

\[
\phi_k = \left[ \frac{(1-\lambda) - \alpha - \lambda(\beta(VA_o))}{(1-\lambda)} \right] \frac{w}{P}
\]

and we see that it is possible to induce the enterprise to hire the efficient level of inputs (that is, the same level of inputs that the profit maximizing firm hires) if \( \alpha = \lambda \beta(VA_o) \). The actual amount of labor being hired depends upon the cost imposed by the budget constraint, \( \lambda \) and the size of the planners' coefficients \( \alpha \), and \( \beta(VA_o) \).

From equations (36-39) we can derive demand functions for both labor and capital services of the following form:

\[
(43) \quad \xi^d = \xi^d \left( \frac{w}{P}, \frac{r}{P}, g, \alpha \right)
\]

\[
- - + \geq 0
\]

\[
(44) \quad k^d = k^d \left( \frac{w}{P}, \frac{r}{P}, g, \alpha \right),
\]

\[
- - + \geq 0
\]

where the signs below the variables are the signs of the partial derivatives and are derived in Appendix C.

The demand for labor by the enterprise in our hypothetical MCPE is inversely related to the price of both inputs. Equations (312) and (313) indicate that the change in demand for labor (capital) with respect to changes in the price of capital (labor) is opposite of
the sign of \( \phi_{kk} \), which we assume is positive. For example, if the price of capital increases (given the other parameters) the enterprise decreases the amount of capital it hires. As a result the marginal product of labor decreases (since \( \phi_{kk} > 0 \)). The enterprise hires less labor as well in order to maintain the equality between the marginal product of labor and its cost (or the distorted cost of (27) or (46)).

If the budget constraint is binding the enterprise will operate at a point such as point A in Figure 2.

![Figure 2: Constrained Operation](image)

The slope of the budget constraint is \( r/(1+\beta(VA_0))w \) and because of the bias toward labor introduced by \( \alpha \) the
enterprise produces at A rather than at a higher level of output at a point tangent to the budget constraint, \( I_1 \).

Equations (328) and (329) indicate that if the budget constraint is relaxed by an increase in the level of government subsidies, \( g_s \), the enterprise will hire more of both capital and labor as the signs in equations (43) and (44) indicate. In Figure 2 this is depicted by an outward shift in the budget constraint from \( k_1k_1 \) to \( k_2k_2 \) brought about by an increase in subsidies from \( g_s \) to \( g_s^* \). The enterprise moves along its expansion path from A to B.

When central planners increase the weight of value added in the enterprise objective function the enterprise responds by increasing the amount of capital and labor it hires, if the budget constraint is not binding. The enterprise is acting as if the cost of labor is \( (1-\alpha)\frac{w}{p} \) so an increase in \( \alpha \) evokes the same response by the enterprise as a decrease in the wage rate. If the enterprise is currently operating at point A in Figure 3 and \( \alpha \) increases from \( \alpha_0 \) to \( \alpha_1 \), the enterprise moves from point A to a point such as B. Planners have increased the weight of value added and decreased the weight of profits in the enterprise objective function. In a sense enterprises are asked to forego profits and increase output and increase the purchase of inputs. Enterprises will do this only if they have accumulated enough revenue from previous periods.
to cover their additional costs, i.e. the budget constraint is not binding. Enterprises, less concerned with the cost of labor since it does not enter value added directly and also less concerned with profits, increase the amount of output they produce by hiring more capital and labor. This increases value added and may decrease profits, but profits are now less important. The amount of capital employed is such that $\phi_k = \frac{w}{p}$ and the amount of labor employed is such that $\phi_l = (1-\alpha)\frac{w}{\beta}$. Each additional unit of labor does not produce enough revenue to cover its actual cost which is $(1+\beta(\text{VA}_0))\frac{w}{p}$. The enterprise must have accumulated enough deposits from previous periods to cover the additional expenditures on labor (otherwise the budget constraint would be binding).
If the budget constraint is binding the enterprise is operating at a point such as point C in Figure 3 and changing α will have no impact upon enterprise behavior. At point C the enterprise does not have any deposits on hand to increase its expenditures on inputs, especially on labor which does not generate enough revenue to cover its cost. Equations (343) and (344) indicate that the impact upon $k^d$ and $k^d$ of an increase in $\alpha$ when the budget constraint is binding is zero. However the shadow cost of the budget constraint increases (or the benefit of relaxing the constraint decreases) as equation (345) indicates ($\frac{\partial \lambda}{\partial \alpha} > 0$). Only if the budget constraint is relaxed, say, by simultaneously increasing subsidies to enterprises, will enterprises increase output and increase the amount of inputs they hire as $\alpha$ increases. Thus, the response of enterprises will be to increase labor and capital services demand and to increase the supply of output as $\alpha$ increases, and the budget constraint is not binding. If the budget constraint is binding there will be no change in the demand for inputs or supply of outputs.

In addition to the factor input demand functions equations (16-39) yield a supply function for the output of the hypothetical MCPE enterprise of the following form:

$$y^s = y^s(k^d(w, \frac{r}{p}, g^s, \alpha), k^d(w, \frac{r}{p}, g^s, \alpha)), \text{ or}$$

$$- - + \geq 0 \quad - - + \geq 0$$
\[ y^S = y^S(\frac{w}{p}, \frac{r}{p}, \bar{y}, \alpha) + \geq 0 \]

where the signs below the variables are the signs of the partial derivatives and are derived in Appendix C. It is clear that if the real prices of factor inputs decrease the enterprise will increase its output. As these prices fall the enterprise hires more factor inputs and as long as their marginal product is positive output will rise. Similarly an increase in subsidies, or in \( \alpha \), when the budget constraint is not binding, will increase the demand for factor inputs and increase the supply of output.

In the enterprise deposit market we see that, like the household, the enterprise simultaneously determines its demand for enterprise deposits (from equation (34)) when it determines its demand for capital and labor, and supply of output. Thus we can write:

\[ \frac{e^d}{p} = \frac{e^d}{p} \left( \frac{w}{p}, \frac{r}{p}, \bar{y}, \alpha \right) + \geq 0 \]

The signs of the partial derivatives are derived in Appendix C. We find from equation (354):

\[ \frac{\partial e^d}{\partial w/p} = \left[ \phi - (1+\beta(VA_o)) \frac{w}{p} \right] \frac{\partial \bar{y}}{\partial w/p} + \beta(1+\beta(VA_o)) \geq 0 \]

If the enterprise hires fewer workers as a result of a wage increase say, total revenue goes down by \( \phi \frac{\partial \bar{y}}{\partial w/p} \).

At the same time expenditures on labor fall by the change
in labor times the cost, \((1 + \beta(VA_o))\frac{W}{p}\). The first term on the right hand side of (47) measures the change in demand for deposits brought about by the marginal change in employment and is positive. The second term on the right hand side indicates that the total amount of labor employed receives more income by an amount \((1 + \beta(VA_o))\) times the increase in the wage rate. The net effect on the demand for deposits depends on whether the first term, the gain in deposits as a result of the decrease in labor demanded, is greater or less than the increased expenditures on the remaining units of labor.

Similarly, for changes in the price of capital equation (35b) indicates:

\[
(48) \quad \frac{\partial (L)}{\partial (\frac{r}{p})} = \left[ \phi_k - (1 + \beta(VA_o))\frac{W}{p}\frac{\partial L}{\partial r/p} \right] + \left( \phi_k - \frac{r}{p} \right) - \frac{\partial k}{r/p} - k
\]

\[
> 0.
\]

The enterprise hires less labor as a result of the changes in the price of capital and the first term on the right hand side indicates that the demand for deposits increases by the decrease in expenditures on labor. Since the enterprise is hiring capital at a position where \(\phi_k = \frac{r}{p}\) a change in the price of capital increases expenditures on capital by the same amount that revenue increases as a result of the additional capital purchased. There is no change in the demand for deposits as a result of changes in the amount of capital demanded. The last term on the
right hand side is the amount that expenditures on capital increase (and the demand for enterprise deposits decreases) since each unit of capital costs more. Again as in the case of changing the wage rate, the net effect depends on whether the gain in deposits is larger or smaller than the increase in expenditures for the higher priced capital goods.

An increase in government subsidies increases the demand for both labor and capital services. Equation (356) gives us:

\[
\frac{\partial e}{\partial \Phi_s} = \left[ \phi_k - \frac{(1+\beta(VA_o))w}{p} \right] \frac{\partial \phi}{\partial \Phi_s} + \left[ \phi_k - \frac{p}{q} \right] \frac{\partial q}{\partial \Phi_s} + 1, \text{ thus}
\]

\[
\frac{\partial e k}{\partial \Phi_s} \geq 0 \text{ as } \left[ \phi_k - \frac{(1+\beta(VA_o))w}{p} \right] \frac{\partial \phi}{\partial \Phi_s} \geq 1.
\]

Again there is a net increase in expenditures, and decrease in demand for enterprise deposits, from the first term on the right hand side. If these expenditures are greater than the amount of subsidies then the demand for deposits falls. If the subsidies are greater than this increase in expenditures the demand for deposits will increase. If enterprises keep a certain portion of the subsidies on hand for transactions purposes the actual amount of subsidies will then be greater than the additional expenditures. In this case the demand for enterprise deposits increases. We assume this to be the case so we can write:

\[
\frac{\partial e}{\partial \Phi_s} > 0.
\]
Since increasing \( \alpha \) induces the enterprise, if the budget constraint is not binding, to hire more labor and capital services, there will be an increase in expenditures. There will also be an increase in revenue from the output that the additional inputs produce. As equation (357) of Appendix C indicates there is a net increase in expenditures (because the cost of labor is greater than the additional revenue it brings in) and as a result a decrease in demand for enterprise deposits.

\[
(50) \quad \frac{\partial g}{\partial \alpha} = [\phi_k - (1+\beta(VA_0))\frac{w^r}{p}] \frac{\partial \xi}{\partial \alpha} + [\phi_k - \frac{r}{p}] \frac{\partial k}{\partial \alpha} < 0
\]

Enterprise behavior can be summarized by equations (43), (44), (45), and (46):

\[
(43) \quad k^d = k^d\left(\frac{w^r}{p}, \frac{r}{p}, \bar{e}_s, \alpha\right) - \quad + \quad \geq 0
\]

\[
(44) \quad k^d = k^d\left(\frac{w^r}{p}, \frac{r}{p}, \bar{e}_s, \alpha\right) - \quad + \quad \geq 0
\]

\[
(45) \quad \psi^s = \psi^s\left(\frac{w^r}{p}, \frac{r}{p}, \bar{e}_s, \alpha\right) - \quad + \quad \geq 0
\]

\[
(46) \quad \frac{\partial d}{p} = \frac{\partial d\left(\frac{r}{p}, \frac{w^r}{p}, \bar{e}_s, \alpha\right)}{\partial \pm \pm + \quad -}
\]

These equations are quite similar to those from a profit maximizing firm in a market type economy. The major differences are due to the institutional framework in which the MCPE enterprise must operate. The MCPE enterprise has an objective function which it maximizes similar to
the profit maximizing firm. The objective function is specified as a linear combination of value added and profits, where $\alpha$ is the weight assigned to value added by the central planners. The enterprise maximizes this objective function subject to a budget constraint: the enterprise must have enough funds available to cover all of its expenditures in each period and may use deposits from previous periods to do so. In addition the enterprise may receive subsidies to offset losses on the production of normally unprofitable goods. As a result of maximizing this objective function the enterprise demands factor inputs for current production, enterprise deposits for future expenditures, and supplies output. Further, when compared to the profit maximizing firm the MCPE enterprise tends to over utilize labor, due to the emphasis on value added in the objective function of the hypothetical MCPE enterprise.

Before turning to the State sector it should be kept in mind that we have assumed that changes in the wage rate and the price of capital services have no impact upon the level of subsidies or $\alpha$. This is probably true in the short run and may be true in the long run as well. However, if factor cost increases generate losses for the enterprise they may, in negotiating with the central planners (for the next planning period), succeed in increasing subsidies (or reducing taxes, negative subsidies in this case).
This may, in fact, be the strategy many enterprises choose rather than changing their input mix.

4.3 The State Sector: Government and Planners

Government behavior with respect to tax policy, credit and money creation, and expenditures on goods and services, is assumed to be exogenous in our hypothetical McPE model. As mentioned in section 4.2 planners' decisions are also assumed to take place in a traditional planning hierarchy external to the model. Nevertheless government policy makers attempt to control, "guide" or "steer," the economy by means of a system of market parameters and direct commands to enterprises. We shall consider two categories of goods, A goods, and B goods, as mentioned in section 4.2. The amount of, and price of, A goods is determined within the planning process. Enterprises receive target output and input figures and, in a rather lengthy, iterative procedure, evaluate these initial figures and then agree to some final target levels of production. We shall assume for simplicity that enterprises, once these targets are determined, successfully meet these deliveries. Further, we shall assume that enterprises are fully compensated by the government for all purchases of the government by means of direct payments. Of the demand for goods by the government, $g^d$, some are consumed, such as those for defense, $g_D$, but most are
redistributed in the form of public services to consumers, \( g_p \). In addition enterprises receive subsidies, \( g_s \). All of these, \( g_d \), \( g_p \), and \( g_s \), are determined within the planning process, external to our model.

The government's demand for goods and services is primarily for A goods, (defense expenditures and heavy investment) \( g^d_A \). The government may also purchase "B goods" on the market, \( g^d_B \). The total demand for goods and services is:

\[
(53) \quad g^d = g^d_A + g^d_B
\]

The total supply of services by the state plus its own consumption equals its demand, so we have as an identity:

\[
(54) \quad g^d = g^d_A + g^d_B = g_p + g_d
\]

In general expenditures by the state sector must be financed by direct taxes, \( T \), or by changes in the money supply. Taxes, \( T \), are direct taxes on the population and for simplicity we do not consider taxes on enterprises explicitly. (We may easily incorporate enterprise taxes if we consider subsidies as currently written as net subsidies. We could then break out enterprise taxes and write them on the right hand side of equation (56) below.) Changes in the money supply may manifest themselves in several ways. The government may increase domestic credit to enterprises or to households. The first increases enterprise deposits as the government simply creates deposits at the National Bank to pay for purchases from enterprises or increase
subsidies. That is, the supply of money is actually the amount of government purchases plus subsidies not financed by taxes. We can write then:

\[(55) \quad \frac{e_s}{p} = g^d + g_s - T\]

Bank loans and the supply of enterprise deposits are policy variables completely independent of the amount of deposits (or savings by households) on hand. (There may be an expansion of enterprise deposits by enterprises granting credits to each other, or accepting delays in contract payments, but these are limited and assumed to be negligible in the hypothetical MCPE developed here. (26)) We take the supply of enterprise deposits to be fixed by the central planners in our model and is therefore exogenous.

The second, an increase in the household money supply, occurs only indirectly in our model since the state makes no purchases directly from households. We assume employment in the state sector may be considered as employment by a representative enterprise and thus increased government employment appears first as increased purchases from enterprises. In general there is no direct change in cash holdings as a result of government purchases. However when government purchases are made or subsidies allocated and credit or money is created it is initially enterprise deposits, but part of it leaks into household currency. The total creation of money is \(\frac{e_s}{p}\) and the distribution of this between enterprise deposits and household currency
depends on the demand for currency and the demand for deposits. The amount of additional household money is equal to additional payments to workers \( d\left(\frac{\bar{w}}{p} + b\right) \), less the additional expenditures and taxes which are converted back into enterprise deposits \( d(c + T) \). The net amount is exactly equal to the amount households are willing to hold, \( \frac{m}{p} \). (We assume \( c^d \) and \( \lambda^S \) meet with planners' approval since the actual amount of cash in circulation is controlled by means of bank control over wage payments.)

The only other means of increasing the household money supply is an increase in direct credits to households, which has been a more recent development in Poland. Loans to households, for example, have grown over 230% from 1971 to 1973, to nearly 11.6 billion zlotys (in current prices). However this is still less than 3% of total credits extended by the National Bank of Poland.\(^{27}\) Thus we assume (as we did in section 4.1) that there is no borrowing in our hypothetical MCPE by households.

Further, since credit creation is generally independent of the amount of savings deposited and interest paid on savings deposits is negligible, savings may be thought of in our model as being held by households themselves without affecting the analytical results of the model. This means that the supply of household money is in a sense endogenous and automatically equal to the demand for household money. (The only way to get more currency into circulation is through
increasing payments to labor, ceteris paribus, and this occurs only if households choose to accept these payments, that is, demand more money.) The state can also directly influence the amount of currency in circulation by changing taxes. By equation (14), \( \frac{m_d}{p} \) changes automatically as taxes change. Thus, increased government expenditures financed by increased taxes does have an effect on the amount of currency in circulation.

Further, there have been periods in which there were forced savings in many East European countries and the Soviet Union (usually in the form of mandatory bond purchases which often were only partially redeemed) but this has not occurred in Poland since the mid-1950s.\(^{28}\) We assume that there is no forced savings of this type in our MCPE model and any government purchases are financed explicitly through changes in \( T \), or \( \frac{s^s}{p} \). Thus we may write the identity between state expenditures and their financing from (55) as:

\[
(56) \quad g^d + g_s = T + \frac{s^s}{p}
\]

We assume also that government policy makers have several goals which they actively pursue: (1) price stability, (2) full employment, and (3) stable and relatively high levels of economic growth. (The planners' goals with respect to the foreign sector shall not be considered in this chapter.) Our model differs from the work of Portes since planners have these as goals. His
initial work [172] assumes prices are fixed and output is completely determined by planners without mention of full employment as a goal. Portes' later work [171] takes full employment and price stability as given and assumes the planners' primary goal is to maximize output with little regard for microeconomic efficiency or traditional Western macroeconomic policy goals. However, his interests are with the classical CPE and (assuming the goals of the planners and other aspects of his models are specified correctly) it is not necessary for him to deal with the complications which arise in the MCPE framework.

Figure 4 depicts the model schematically. It may be summarized as:

The labor market:

\begin{equation}
\lambda^d = \lambda^d(w, r, g_s, \alpha) \quad - - + \geq 0
\end{equation}

\begin{equation}
\lambda^s = \lambda^s(w, \Omega, g_p) \quad + - +
\end{equation}

The commodity market:

\begin{equation}
c^d = c^d(w, \Omega, g_p) \quad + + 
\end{equation}

\begin{equation}
k^d = k^d(r, w, g_s, \alpha) \quad - - + \geq 0
\end{equation}

\begin{equation}
g^d = g^d
\end{equation}

\begin{equation}
y^d = c^d + \frac{g^d}{p} + g^d = y^d(w, r, \Omega, g_s, g_p, \alpha) \quad \pm - + - \pm \geq 0
\end{equation}
\[(63) \quad y^S = y^S \left( \frac{\bar{w}}{\bar{p}}, \frac{\bar{r}}{\bar{p}}, \varnothing_s, \alpha \right) - - + \geq 0 \]

The demand for household currency:
\[(64) \quad \frac{m^d}{\bar{p}} = \frac{m^d}{\bar{p}} \left( \frac{\bar{w}}{\bar{p}}, \varnothing, \varnothing_p \right) + - \pm \]

The demand for enterprise deposits:
\[(65) \quad \frac{e^d}{\bar{p}} = \frac{e^d}{\bar{p}} \left( \frac{\bar{w}}{\bar{p}}, \frac{\bar{r}}{\bar{p}}, \varnothing_s, \alpha \right) \pm \pm + - \]

The supply of money or the government budget constraint:
\[(66) \quad \frac{e^s}{\bar{p}} = g^d + \varnothing_s - T \]

The distribution of government services:
\[(67) \quad g^d = g^d_n + g^d_B = \varnothing_p + \varnothing_D \]

4.4 Market Clearing Conditions

Production and consumption are determined by enterprises, planners and consumers as specified in sections 4.1, 4.2 and 4.3. Voluntary exchange takes place in the labor market and commodity market. Voluntary exchange for households implies that no household may be forced to offer more labor or buy more goods than it chooses, given the prevailing prices, wealth, and public services. For
Figure 4. The Closed Economy
enterprises voluntary exchange means that no enterprise may be forced to offer more output or to purchase more inputs than it chooses given the prevailing prices, control parameters, and objective function. Assuming each household and enterprise is representative, and ignoring any other aggregation problems, equations (57)-(67) may be taken as aggregate supply and demand functions, $p, w, \text{ and } r$ are then weighted indices of all types of labor goods (both A and B). The labor market clearing condition is:

\[(68) \quad \ell^d (\frac{w}{p}, \frac{r}{p}, \varepsilon_s, \alpha) = \ell^s (\frac{w}{p}, \Omega, \varepsilon_p) = \ell\]

where the superscripts refer to the amount of labor demanded and supplied while $\ell$ is the actual amount exchanged.

Notional labor demand is determined by $\frac{w}{p}, \frac{r}{p}, \varepsilon_s$ and $\alpha$. The notional supply of labor is dependent upon $\Omega, \frac{w}{p}$, and $\varepsilon_p$. Figure 5 below illustrates the market clearing conditions graphically. The labor supply curve is drawn for three different levels of wealth ($\Omega_1 < \Omega_* < \Omega_2$), and the labor demand curve is drawn for three different levels of subsidies ($\varepsilon_{s_1} < \varepsilon_{s_*} < \varepsilon_{s_2}$) and constant $\frac{r}{p}, \alpha$.

There are many combinations of $\frac{w}{p}, \frac{r}{p}, \Omega, \varepsilon_s, \alpha$, and $\varepsilon_p$ which are consistent with market clearing and $(\frac{w}{p})^*$. 
\( \frac{r}{p} \), \( \Omega \), \( e_s \), \( \alpha \), \( e_p \) is one of these combinations.

If we have \( \frac{r}{p} \), \( \Omega \), \( e_s \), \( e_p \), \( \alpha \) then at real wage levels below \( \frac{w}{p} \) there would be excess demand for labor services. Similarly, if \( \frac{w}{p} = \frac{r}{p} \), \( e_s = e_s^* \), \( \frac{r}{p} = \frac{r}{p}^* \), \( e_p = e_p^* \), and \( \alpha = \alpha^* \), then \( \Omega > \Omega^* \) implies excess demand for labor and last, with \( e_p^* \), \( \frac{w}{p} \), \( \Omega \), \( \frac{r}{p} \), \( \alpha \), then \( e_s < e_s^* \) implies excess supply of labor.

\[
\begin{align*}
\text{Figure 5. The Labor Market}
\end{align*}
\]

In the commodity market the clearing condition is:

\[
(69) \quad y^s \left( \frac{w}{p}, \frac{r}{p}, e_s, \alpha \right) = c^d \left( \frac{w}{p}, \Omega, e_p \right) + k^d \left( \frac{r}{p}, \frac{w}{p}, e_s, \alpha \right) + \varepsilon^d \quad - - + \geq 0
\]

\[
+ + \geq 0
\]

\[
- - + \geq 0
\]
We shall assume for simplicity that \[ \frac{\partial c}{\partial w} > \frac{\partial k}{\partial w}, \] so we have:

\[(70) \quad y^s(w, r, g_s) = y^d\left(\frac{w}{p}, r, \Omega, g_s, g_p, \alpha \right)\]

Figure 6 below illustrates the market clearing conditions.

The supply of output, \(y^s\), is drawn for three different levels of subsidies \((g_{s_1} < g_{s*} < g_{s_2})\) and fixed \(r, \alpha\).

The demand for output is also drawn for three different levels of subsidies and \(g_p, \Omega, \frac{r}{p}, \alpha\) fixed.

![Figure 6. The Output Market](image)

Again there are several combinations of \(\frac{w}{p}, \frac{r}{p}, \Omega, g_s, g_p, \) and \(\alpha\), which are consistent with market clearing and \(\left(\frac{w}{p}\right)^*, \left(\frac{r}{p}\right)^*, \Omega^*, g_s^*, g_p^*, \alpha^*\) is one of them. If we have
\( \left( \frac{r}{p} \right)^*, \Omega^*, \varepsilon_s^*, \varepsilon_p^* \) and \( \alpha^* \), then \( \frac{W}{p} > \left( \frac{W}{p} \right)^* \) implies excess demand for commodities.

We may also consider \( y^d \) and \( y^s \) as we vary other variables, \( \frac{r}{p} \), \( \Omega \), \( \varepsilon_p \), and \( \alpha \). For example, Figure 7 illustrates \( y^d \) and \( y^s \) for different levels of wealth \( (\Omega_1, \Omega^*, \Omega_2) \).

\[
\begin{align*}
\frac{W}{p} & \quad \frac{y^d(\Omega_1)}{y^d(\Omega^*)} \\
(\frac{W}{p})^* & \quad \frac{y^d(\Omega_2)}{y^s}
\end{align*}
\]

Figure 7. The Output Market

Again \( \Omega^*, (\frac{r}{p})^*, (\frac{r}{p})^*, \varepsilon_s^*, \alpha^*, \varepsilon_p^* \) is a market clearing combination. If we have \( \varepsilon_p^*, (\frac{W}{p})^*, (\frac{r}{p})^*, \varepsilon_s^*, \alpha^* \) and \( \Omega > \Omega^* \) there will be excess demand for commodities.

There are many combinations of \( \frac{W}{p}, \frac{r}{p}, \Omega, \varepsilon_s, \varepsilon_p, \alpha \) which are consistent with market clearing in each market. If we set \( \frac{r}{p} = (\frac{r}{p})^*, \alpha = \alpha^*, \varepsilon_p = \varepsilon_p^*, \varepsilon_s = \varepsilon_s^* \), then \( \Omega^* \) and \( (\frac{W}{p})^* \) is the only combination of \( \Omega \) and \( \frac{W}{p} \) which is
consistent with market clearing in both markets. To illustrate equilibrium in both markets let us depict the locus of all combinations of $\Omega$ and $\frac{w}{p}$ which guarantee $\lambda^s = \lambda^d$ and $y^s = y^d$ in a manner similar to that of Barro and Grossman [16]. In Figure 8 the locus $\lambda^d = \lambda^s$ is all combinations of $\Omega$ and $\frac{w}{p}$ consistent with market clearing in the labor market. This locus is upward sloping. To illustrate, consider the case where the labor market is initially in equilibrium and then $\Omega$ is increased. As $\Omega$ increases there is a decrease in the supply of labor resulting in excess demand ($\lambda^d > \lambda^s$). To restore equilibrium an increase in the real wage ($\frac{w}{p}$) would be required. This increase causes $\lambda^s$ to increase and $\lambda^d$ to decrease, eventually restoring equilibrium. Thus the $\lambda^d = \lambda^s$ locus is upward sloping. Below the locus $\lambda^d > \lambda^s$ and above it $\lambda^d < \lambda^s$.

Similarly the locus $y^d = c^d + k^d + g^d = y^s$ depicts the locus of $\Omega$ and $\frac{w}{p}$ which are consistent with equilibrium in the commodity market. To illustrate that the slope of this locus is negative, suppose the commodity market is in equilibrium and $\Omega$ is increased. The effect is to increase demand for commodities by consumers, causing excess demand. $\frac{w}{p}$ would have to decrease, causing $y^s$ to increase and $y^d$ to decrease, for equilibrium to be re-established. Thus, the locus is downward sloping. Below it $y^d < y^s$ and above it $y^d > y^s$. 
\( \Omega^* \) and \( \left( \frac{W}{P} \right)^* \) is the only combination of \( \Omega \) and \( \frac{W}{P} \) consistent with market clearing in both markets and \( g_s^* \), \( \alpha^* \), \( \left( \frac{P}{P} \right)^* \), \( g_p^* \). Thus, if \( g_s^* \), \( \alpha^* \), \( \left( \frac{P}{P} \right)^* \), \( g_p^* \), are set by the planners as general parameters, the combination \( \Omega^* \), \( \left( \frac{W}{P} \right)^* \) then allows us to determine \( l^* \), and \( y^* \) from (68) and (69), assuming the bonus and tax rates are given. Then with \( M(0) \) and \( N \) given exogenously the value of \( \Omega^* \) allows us to determine \( P^* \) from (17) and \( W^* \) can be found from \( W^* = P^* \left( \frac{W}{P} \right)^* \).

We can also use this framework in examining the effects of changes in the planners' variables, \( \alpha \), \( g_p \), and \( g_s \). In this chapter we have assumed that either market forces or planners adjust \( \frac{W}{P} \) and \( \frac{P}{P} \) to attain equilibrium. The changes necessary for \( \frac{P}{P} \) and \( \frac{W}{P} \) to maintain an equilibrium,
after a change in $\alpha$, say, are examined in section 4.6 below (again assuming prices and wages adjust so an equilibrium can be attained). Recall, however, that in actuality in Poland, prices and wages are not always flexible and often planners deliberately set prices and wages below the market clearing levels. A-goods have planned prices which are fixed and wage rates are generally fixed as well. Thus, if they are fixed below the market clearing levels there is resulting excess demand which is persistent. Further, there may be sticky prices in the markets for B goods which prevents the markets from clearing as well. In Chapter 5 these disequilibrium aspects are examined more closely.

4.5 The Aggregate Budget Constraint

We found above that households' decisions must conform to their budget constraint:

\[(71) \quad c^d + \frac{m^d}{p} + T = \frac{w^s T}{p} + b\]

Households engage in three activities: they demand commodities and money balances and they supply labor services. However, due to the budget constraint there are only two degrees of freedom; once the demand for commodities and the supply of labor services has been determined the demand for money balances has been also.

In addition the government is also constrained, from (56):

\[(72) \quad g^d + g_s = T + \frac{e^s}{p}\]
That is, government purchases must be financed by taxes or changes in the money supply.

Enterprises as well are constrained since we have from equations (33) and (34):

\[ (73) \quad \Pi = b + \frac{e^d}{p} - g_s = y^S - \frac{w^d}{p} - \frac{r^d}{p}, \text{ or} \]

\[ (74) \quad b = y^S - \frac{w^d}{p} - \frac{r^d}{p} + g_s - \frac{e^S}{p} \]

From these three constraints on each sector of the economy we can derive an economy wide budget constraint:

\[ (75) \quad (c^d + g^d + \frac{r^d}{p} - y^S) + (\frac{w^d}{p} - \frac{w^s}{p}) + (\frac{m^d}{p} + \frac{e^d}{p} - \frac{e^S}{p}) = 0 \]

As a result of the economy wide budget constraint, if the commodity and labor markets are clearing then the money markets must clear as well. As in the market economy, Walras' Law insures us that we may consider all but one market since the sum of all excess demands must be zero.

4.6 The Examination of Exogenous Changes

In this section we shall consider two changes which planners may undertake: a change in tax policy and a change in \( w \), the weight planners assign to value added. First, suppose the central planners decide to reduce personal taxes, \( T \). What will be the changes which are necessary to maintain equilibrium? Although we specified bonuses and taxes as dependent upon income let us consider them as exogenous for simplicity. This does not change the qualitative aspects of the maximization problem for households
in section 4.1 (except to make it simpler) and the signs of the labor supply and consumer goods demand equations are not changed. Equation (16) now becomes total nonwage wealth:

\[(76) \quad \Omega = \frac{M(0)}{p} + N^*(b-T)\]

A reduction in taxes will have several effects. First, the most immediate effect will be an increase in the demand for household money in the very first period, since:

\[(14) \quad \frac{m^d}{p} = \frac{w^s}{p} + (b-T) - c^d\]

Second, some of the additional disposable income will be consumed. The exact division of the income between savings and consumption depends on the size of the tax reduction and households' expectations about how long the lower taxes will prevail. Nevertheless since the initial impact is \(\frac{m^d}{p} > 0\), \(\Omega\) increases (from (76)). Then as \(\Omega\) increases households desire to consume more (from equation (18)) and if the tax reduction is large enough and \(\Omega\) increases enough they will eventually decrease the amount of labor services they offer (from equation (19)). This results in excess demand on both the consumer goods market and the labor market.

In order to offset the excess demand in each market \(w\) and \(p\) must, by means of planners' actions for A goods and market pressures for B goods, increase enough to return \(\Omega\) and \(\frac{w}{p}\) to \(\Omega^*\) and \((\frac{w}{p})^*\), the market clearing values. This
occurs only if \( p \) increases (and thus decreases \( \Omega \)) enough to offset the decreases in \( T \), and \( w \) increases proportionately so that \( \frac{W}{P} = \left( \frac{W}{P} \right)^* \). Market pressures in the \( B \) goods market and labor market will tend to move prices in the correct direction. Planners must also increase the price of \( A \) goods accordingly. More precisely the increase in the weighted price level and proportional increase in wage rates, necessary to restore equilibrium can be found by differentiating equation (76) and solving for \( dP \). We get:

\[
(77) \quad d\Omega = \frac{PdM}{P^2} - \frac{MdT}{P^2} - NdT = 0,
\]

which implies:

\[
(78) \quad dP = - \frac{N}{M} P^2 dT = d\bar{w}.
\]

If initially the government budget is balanced, so that government expenditures equal tax revenue, then the government creation of money must be zero:

\[
(79) \quad \frac{e_s}{P} = g^d + g_s - T = 0
\]

But if the level of government expenditures remains the same, the supply of money, \( \frac{e_s}{P} \), must increase:

\[
(80) \quad d\frac{e_s}{P} = -dT
\]

When taxes are reduced there is an automatic increase in household cash by a like amount, \( \frac{m}{P} \), from (14). As households adjust their holdings of money, saving more, consuming more and working less, the distribution of money between
household cash and enterprise deposits is readjusted. The increase in holdings of household cash must eventually appear as a decrease in enterprise deposits which the government offsets. If there is a flow demand for household money balances, \( \frac{m^d}{p} > 0 \), then there must be a flow of enterprise deposits to households since the only way cash comes into circulation is by means of wage payments to labor by enterprises (assuming cash transfers to households from the government are negligible). As a result of a decrease in taxes, \( \frac{m^d}{p} > 0 \), which implies \( \frac{e^d}{p} < 0 \). Enterprise deposits begin to fall unless the government offsets the fall by increasing the money supply by \( \frac{d^e}{p} = -dT \), that is, balance the budget.

In any case \( \frac{m^d}{p} > 0 \) implies \( \frac{M}{p} \) and therefore \( \Omega \), are increasing and continue to increase as long as taxes are such that \( \frac{m^d}{p} > 0 \). This causes a continuing increase in \( c^d \) and decrease in \( l^s \). \( w \) and \( p \) must continue to increase (at an equal rate), to keep \( \Omega \) unchanged over time, until taxes increase to their previous level or government expenditures decrease. When taxes increase, or government expenditures decrease, \( p \) and \( w \) then fall to maintain \( \Omega^* \) and \( \frac{(u)}{p}^* \). However, since \( \Omega \) has increased by the amount of accumulated household cash, \( M = \int m^d dt \), \( p \) and \( w \) do not return to their original values. The new \( p^* \) and \( w^* \) are
greater than the old equilibrium values by the amount necessary to return $\Omega$ to its initial value.

The second type of exogenous change which we shall discuss is a change in the planners' parameter $a$, the weight assigned to value added. Suppose planners choose to emphasize value added, more strongly in the enterprise objective function and as a result increase $a$. This change has no immediate effect upon consumer behavior. From equations (57, 60, 62, 63, 65) however, we see that an increase in $a$ will have an immediate impact upon the production decisions of enterprises. For unconstrained enterprises an increase in $a$ increases the demand for factor inputs, both labor and capital, and decreases the demand for enterprise deposits. In addition there is an increase in the supply of output.

To determine the impact of $da$ upon the real wage, the real cost of capital services and the level of wealth we must totally differentiate:

\begin{align*}
(81) & \quad \lambda^d(\frac{w}{p}, \frac{r}{p}, g_s, a) - \lambda^s(\frac{w}{p}, \Omega, g_p) = 0 \\
& \quad - - + 20 + - \\
(82) & \quad y^d(\frac{w}{p}, \frac{r}{p}, \Omega, g_s, g_p, a) - y^s(\frac{w}{p}, \frac{r}{p}, g_s, a) = 0 \\
& \quad + - + + \pm 20 - - + 20 \\
(83) & \quad m^d(\frac{w}{p}, \Omega, g_p) + e^d(\frac{w}{p}, \frac{r}{p}, g_s, a) - \frac{e^s}{p} = 0 \\
& \quad - + \pm \pm \pm \pm + -
\end{align*}

and solve for $(\frac{w}{p})^*, (\frac{r}{p})^*, \Omega^*$. However, as is indicated in Appendix D it is impossible to determine these signs without making specific assumptions about: (1) the own and cross
price elasticities of demand and supply of labor, capital services, output, and money, and (2) the elasticity of output demand and labor supply, and household money demand with respect to changes in wealth. Appendix D derives expressions for \( \frac{dW}{d\alpha} \), \( \frac{dR}{d\alpha} \), \( \frac{d\pi^*}{d\alpha} \) and discusses the conditions under which they are positive or negative, and methods for empirically testing for these signs. In general we find that the equilibrium real wage will increase as a result of an increase in demand for labor brought about by the increase in \( \alpha \). The equilibrium real price of capital services and the equilibrium level of real wealth may increase or decrease depending upon the exact values of the elasticities mentioned above.

4.7 Summary

In this chapter the microeconomic foundations of the hypothetical MCPE have been analyzed in the equilibrium, market-clearing framework. In Section 4.1 household behavior was considered. Households are assumed to maximize household utility (which was specified as a function of consumer goods, leisure, and public goods), subject to a budget constraint. The household was assumed to have some initial wealth, a stock of money balances. Households receive both wage and bonus income and pay taxes. In Appendix B the demand for consumer goods and money balances and the supply of labor are derived. The signs of the partial derivatives of each with respect to the real wage,
the level of wealth and the level of public goods provided are also determined in Appendix B and discussed in detail in Section 4.1.

Section 4.2 considers enterprise behavior. The basic framework of the enterprise in the hypothetical MCPE is constructed to conform in most aspects to the enterprise in the Polish economy. Following a brief discussion of the three broad categories of variables which influence enterprise behavior in the Polish economy (the first group includes such variables as prices, the second is the "general supporting parameters" to redirect economic activity and the third, direct commands), and the A-, B-good distinctions, the enterprise objective function is discussed. Enterprises are assumed to maximize an objective function which may be expressed as a linear combination of value added and profits. The relative weight that each of these is assigned in the objective function is a control variable of the central planners.

In Appendix C the enterprise' demand functions for labor, capital services and enterprise deposits and the supply of output are derived. The signs of the partial derivatives of each function with respect to the real wage, the real cost of capital services, government subsidies and the relative weight of value added (in the objective function) are derived in Appendix C as well, and discussed in Section 4.2. The optimal conditions for the hiring of labor
and capital services are determined and compared to the profit maximizing firm. It is shown that because of the importance of value added in the objective function of the MCPE enterprise, the enterprise tends to overutilize labor (relative to capital services) when compared to the profit maximizing firm.

The State, or Government, behavior is outlined in Section 4.3. Government demand for goods and services, assumed to be exogenous, consists of demand for goods which are redistributed to other sectors of the economy or consumed within the government sector (such as defense). Government expenditures are financed either via taxes or an increase in the money supply. In sections 4.4 and 4.5 the model is aggregated, the market clearing conditions are illustrated graphically and the aggregate budget constraint is defined.

Using the model as developed in the earlier sections of this chapter two exogenous changes (the first in the level of taxes and the second in the relative weight of value added in the enterprise objective function), are considered. It was found that when taxes are decreased there is an increase in household wealth, which causes an increase in demand for consumer goods and a decrease in the supply of labor. This generates an increase in the wage rate and the price level which, if equiproportional will return the real wage and the level of wealth to their
equilibrium levels. However, the increase in wages and prices must continue until taxes are restored to their initial level or government expenditures are decreased. When the weight of value added in the enterprise objective function is increased we find that the impact upon the real wage, the real cost of capital services, and the level of wealth, depend upon the own and cross price elasticities of demand and supply of labor, capital services, output, and money, as well as the elasticity of demand for output and supply of labor, and household money demanded with respect to changes in wealth. In general we find that the real wage will increase when the weight on value added increases, but the changes in the real cost of capital and the level of wealth depend upon the exact values of the elasticity mentioned above.

In this chapter both the microeconomic and macroeconomic behavior of the actors of the hypothetical modified centrally planned economy have been considered. However, their behavior has been considered in a closed economy framework in an environment which allows markets to clear. In the next chapter we develop the model further, assuming that in some markets prices are fixed and excess demands are generated and allowed to persist. Using the Barro-Grossman non-market clearing paradigm the behavior of the actors of the hypothetical MCPE is examined in more detail. In Chapter 6 the model is opened to foreign trade and the
actions of households and enterprises are examined when there are disturbances from the foreign sector in both an equilibrium and a disequilibrium framework.
Notes to Chapter 4

(1) That households continue to behave as they would in a capitalist market economy, maximizing utility subject to a budget constraint, is a common assumption. Prices are treated as parameters set by the central planners. In the model below we adopt the notation and basic formulation of households from Barro and Grossman [16].

(2) See Podolski [168] for a complete description of the Polish banking system and the types of accounts available to households.

(3) See Barro and Grossman [16].

(4) We assume there are no income distribution effects for simplicity. See Barro and Grossman [16], pp. 16 and 17. See Barro and Grossman [16] for the derivation in an optimal control contest.

(5) Maly Rocznik Statystyczny, 1974, Chapter 7, tables 7 and 9.

(6) See Fallenbuchl [64] for a more detailed description of the planning and control process.

(7) See Tyminski [217], Nuti [162], Plowiec [169] and Adam[1] for further discussion of these instruments of control.

(8) We are implicitly assuming enterprises producing B goods are perfect competitors or are acting as if they were. This, of course, may not be the case.

(9) See Machowski [138].
(10) See Fallenbuchl [64] for a general description of these instruments and Plowiec [167] and Polaczek [169] for a more detailed description of price equalization subsidies and exchange rate policies.

(11) See Machowski [136], Fallenbuchl [64], and Nuti [162] for further details.

(12) J. Szydlak, "Lepsze funkcjonowanie gospodarki-lepsze warunki zycia spokczenstwa" in Doskonalenie procesu planowania, zdszadzania i kierowania gospodarka ndrodowa as quoted in Nuti [162].

(13) Currently there is substantial debate as to the importance of prices vis-a-vis other nonprice control variables as a means of guiding enterprise behavior. See Czerswinski [48] and Marczewski [148].

The method that planners use to determine the control parameters has varied during the period in which the WOG system has been operative as well. For a description of the changes in the process of determining the additions to wage funds (workers' bonuses) see Wanless [228].

(14) Similar to Barro and Grossman [16]

(15) Zwass [246] p. 49 maintains that Poland has a system of centrally fixed prices but others, Plowiec [167]
Tyminski [217] and recent conversations with Polish economists indicate that there are two basic types of commodities: the A and B goods described above. 

(16) Enterprises do have significant input into the planning process and may influence the central planners decisions with respect to the levels of subsidies and purchases as well as prices, bonus coefficients, etc. We assume for simplicity however that the representative enterprise has little or no bargaining power or if it does, it does not choose to influence the planning process.

(17) See section 4.3, the State-Central Planners Sector below, and Figure 4.

(18) The exact definition of production added, using Nuti's notation, is: $VA = S + A + g - M - K - Z$

where $S$ is total sales and foreign trade earnings, $A$ is export subsidies, $g$ is net taxes or subject subsidies, $M$ is material costs, $K$ is capital costs and $Z$ is "incorrect profits" or accounting discrepancies. See Nuti [162] and Wanless [228] for further details.

(19) See Nuti [162] for a comparison between the value added maximizer and the profit maximizer in a static one period case. Nuti does not consider the role of control parameters (such as $a$, discussed below). He considers primarily the profit
maximizing case and the implications for expenditures out of the enterprise development fund (retained profits). He does not consider the direct implications of an objective function which is a function of both value added and profits nor does he compare the Polish profit maximizing enterprise with the competitive profit maximizing firm in a market economy.

(20) Here, we follow the example of Domar [53] when he examines Soviet enterprise behavior and assumes a linear relationship between the value of sales and profits.

(21) Podolski [168] outlines the method of enterprise control by the enterprises' bank. All excess funds must be kept in one bank (branch) which audits and approves transactions by the enterprise.

(22) Again, we assume a linear combination for simplicity. Nuti [162] p. 388, estimates that value added and profits have a relative importance of approximately ten to one.

(23) Nuti [162], p. 361.

(24) See Podolski [168].

(25) The signs of the partial derivatives have been found not to change in the two period case. The one period model is used here only for simplicity.

(26) See Podolski [168] for a thorough description of socialist banking in Poland and a description of the potential credit creation capabilities of enterprises.
(27) Rocznik Statystyczny 1974, Chapter 25.

(28) Zwass [246].
Chapter 5: Disequilibrium Aspects of the Closed Modified Centrally Planned Economy

5.0 Introduction

In the model presented in Chapter 4 we saw that the central planners affect the actions of enterprises in several ways. Central planners influence the level of employment and output via changes in $a$, the weight of value added in the enterprise objective function. They also provide subsidies (or taxes), $e_s$, to enterprises. In Chapter 4 we assumed that the price level, $P$, the wage rate, $w$, and the price of capital inputs, $r$, would adjust via market forces or by central planners' perfect knowledge of market clearing conditions, to always leave the economy in equilibrium.

In this chapter we shall consider several cases in which the wage rate and price level are such that markets do not clear. In the A goods sector, predominantly heavy industry, raw materials and defense expenditures, prices and wages are more strictly controlled than in the B goods sector, which are primarily consumer goods and less critical intermediate inputs. For simplicity we shall assume that the economy is initially in a state of equilibrium, with all markets clearing and then consider an exogenous change
which disturbs the markets. In section 5.1 we consider a case of sectoral disequilibrium in a more disaggregated model. Both consumer goods and capital services are disaggregated into A and B types. Assuming the price of A goods and wages are fixed by the central planners, an exogenous change in the demand for B goods disturbs the equilibrium, and the resulting changes in supply and demand for both A and B goods and labor are outlined.

In sections 5.2 and 5.3 a model is developed to analyze the case of generalized excess demand (excess aggregate demand for consumer goods and for labor). The model is developed along the lines of the traditional non-market clearing (NMC) paradigm described by Barro and Grossman. The basic criticism of the Barro and Grossman model is the lack of explanation of why prices are fixed and markets do not clear. In the MCPE model developed here this problem may be set aside. "The problem of explaining the failure of markets to clear does not arise in situations in which legal restrictions prevent wage and price adjustments."(1) Thus the NMC paradigm as they develop it appears to lend itself to the MCPE even more than to the market type economy. The determination of output and employment is then discussed in section 5.4.

Section 5.5 considers the case in which there are fixed prices only on A-type goods and fixed wage rates. In
this case there is excess demand for A-type goods and labor rather than the generalized excess demand outlined in sections 5.2 through 5.4. The level of disequilibrium is examined and a comparison of the CPE, with a relatively large number of A-type goods with fixed prices, and the MCPE, with fewer A-type goods, is made. Section 5.6 then offers a summary of the analysis of this chapter.

5.1 A Disaggregated Model and Sectoral Excess Demand

The model of Chapter 4 may now be disaggregated into A and B type goods. In doing so we assume that enterprises maximize the same type of objective functions, have the same production functions, and are subject to the same type of influence by central planners, whether they produce A or B goods. The major differences between the enterprises which produce A goods and those which produce B goods are (1) the degree of influence or control planners exert in terms of the magnitudes of $g_s$ and $a$, (2) the fact that prices for A type goods are fixed, and (3) the fact that enterprises producing a particular A good may be guaranteed a minimum level of A good inputs. Enterprises are free to purchase as much of any input, labor, or A or B type capital services, if it is available. Planners specify only minimum levels of A type capital services for enterprises producing A type output (either consumer goods or capital services). They also specify planned output levels for A type goods. In the event of shortages of A type inputs central planners
ration these inputs ensuring that enterprises producing A type output receive their minimum levels. The enterprise may purchase additional inputs on the market for the fixed price, competing with other enterprises (those producing A goods and those producing B goods) for the available inputs.

Even though the output levels of A type goods are planned, this does not mean planned levels will actually be produced. The actual amount produced is dependent upon the enterprises' behavior, as outlined in Chapter 4, and only if central planners provide the enterprise with precise incentives (in the form of prices, wages, subsidies and α) will the exact, planned level of output be produced. In fact, in Poland and most CPEs it is rare that the planned output levels are exactly met. The plan is generally under- or over-fulfilled (or revised so as to appear to be fulfilled).

Now let us consider each market in turn as we disaggregate the model. In the labor market we assume that there are no differences among workers and there is perfect mobility among enterprises and sectors so the supply of labor is the same as that of the model of Chapter 4. The demand for labor however, is made up of the demand by enterprises producing A goods and by enterprises producing B goods. Since there is only one type of labor and the wage rate is fixed we may write the excess demand for labor as:
\( E^d_k = \lambda^d_A(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) \)
\[ \begin{align*}
&+ \lambda^d_B(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) \\
&- \lambda^S(w, P_A, P_B, \Omega, \varepsilon_S) \\
&+ - - - +
\end{align*} \]

where all prices and wages are in nominal terms. The subscripts on the price of consumer goods and capital services indicate whether they are A or B goods. The subscripts on the labor demand functions indicate whether the labor is employed by enterprises producing A or B type goods. The demand for labor functions indicate that when enterprises hire labor, they take into account not only the price of labor, \( w \), but the prices of other factor inputs, \( r_A, r_B \), fixed and flexible priced capital services respectively, the prices of outputs which they may produce, \( P_A, P_B \), (and \( r_A \) and \( r_B \) if it produces capital services) and the government control parameters, \( \varepsilon_S, \alpha \). The signs of the partial derivatives are given below the variables in each function and follow from the model of Chapter 4.

In the market for consumer goods we now have a supply and demand function for both A and B type consumer goods. The excess demand for A type consumer goods may be written as:
(85) \[ E_{cA}^{d} = c_{A}^{d}(w, P_{A}, P_{B}, \Omega, \xi_{P})^{+} + - \pm + \pm - \pm \]

\[ - c_{A}^{S}(w, P_{A}, P_{B}, r_{A}, r_{B}, \xi_{S}, \alpha_{cA})^{+} + - - + + + \]

where the subscripts have the same meaning as above and the signs beneath the variables are the signs of the partial derivatives. The demand for A goods by consumers depends upon the wage rate, the price of A goods, wealth, and the provision of government services to households in a manner identical to the model of Chapter 4. In addition the price of B goods enters, but the response depends upon whether A and B type consumer goods are substitutes, complements or unrelated in consumption. The supply of type A consumer goods depends on the wage rate and price of other factor inputs, the prices of the outputs the enterprise may produce, and the government control parameters. The excess demand for B goods by consumers may be written in a similar manner:

(86) \[ E_{cB}^{d} = c_{B}^{S}(w, P_{A}, P_{B}, \Omega, \xi_{P})^{+} - c_{B}^{S}(w, P_{A}, P_{B}, r_{A}, r_{B}, \xi_{P}, \alpha_{cB})^{+} \]

\[ + \pm - + \pm - - + + + \]

In the capital services market there are again A and B type goods and a supply and demand for both. The excess demand for type A capital service may be described as:
(87) \[ E^d_{K_A} = K^d_{A}(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) \]
\[ + + - + + + \]
\[ - - - \]
\[ - K^s_{A}(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha_{K_A}) \]
\[ + \varepsilon - + - + + + \]

The demand for type A capital services is similar to the demand functions derived in Chapter 4 and we now write the supply of capital services explicitly. In both functions the prices of type B capital services enters. The sign of the partial derivative in the demand function, however, depends on whether A and B type capital services are substitutes, complements, or unrelated factors of production. In the supply function for A type capital services the prices of factor inputs, \( r_A \) and \( r_B \), enter and the signs may also be positive, negative or zero, depending upon the degree to which they are substitutes or complements in production. Further, we assume that if \( r_A \) increases, the supply of type A capital services increases. (That is, if type A capital services are used in the production of type A capital services the effect of an increase in the price, as a factor input, does not outweigh the effect of the increase in the price as an output.)

The excess demand for type B capital services may also be written as:

(88) \[ E^d_{K_B} = K^d_{B}(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) \]
\[ + + + - + + + \]
\[ - K^s_{A}(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha_{K_B}) \]
\[ + \varepsilon - + - + + + \]
The money markets, the demand for cash by households, the demand for deposits by enterprises and the supply of money as a result of purchases or subsidies by the government are not changed from the formulation of Chapter 4. The excess demand for money may be written as:

\[ E_m^d = m^d(w, P_A, P_B, \Omega, \xi_P) \]
\[ + e^d(w, r_A, r_B, p_A, p_B, \xi_S, \alpha) - e^s \]

Recall from section 4.2 that the signs of the demand for enterprise deposits with respect to factor input prices may be positive or negative. Referring to equations \((47)\) and \((48)\) we see that if there were no bonus payments to labor \(\beta(VA_0) = 0\) the signs with respect to factor prices would be negative and the signs with respect to output prices would be positive. In general we would expect the partials to have these signs even if \(\beta(VA_0) > 0\), but we must also consider the possibility that they may be just the opposite and give us unusual results.

The government sector is also identical to that of Chapter 4:

\[ (P_A \xi_A^d + P_B \xi_B^d) + \xi_S = T + e^s \]

Now assuming no change in government behavior (with respect to taxes, subsidies, the provision of public
services, money creation or government demand for goods and services) we can determine the impact of changes in prices upon the level of excess demand in each sector by examining equations (84) through (89). In Appendix E these equations are totally differentiated with respect to \( w, P_A, P_B, r_A, \) and \( r_B \).

As an example let us consider the following case. First, recall that planners control A good prices and the wage rate, so assume that \( P_A, r_A, \) and \( w \) are fixed and planners do not change these prices regardless of market pressures. Let us assume that all markets are in equilibrium and there is an exogenous increase in the demand for B type consumer goods (\( dc_B^d > 0 \)). Corresponding to this is a decrease in the demand for money balances by households equal to \( -P_B dc_B^d \). We wish to determine the impact of this disturbance upon all of the remaining markets assuming the B type consumer goods and B type capital services markets clear since their prices are flexible.

From equation (389) of Appendix E we can examine the changes in each market. First let us consider the B goods markets and then the A goods and labor markets. In the market for B consumer goods we have:

\[
(91) \quad E^d_c = \hat{f}_B c_B \left[ \xi_{P_B} c_B^{c_B} - \xi_{r_B} c_B^{r_B} \right] - \hat{f}_B c_B \xi c_B^{r_B} + dc_B^d = 0
\]

where "^" indicates a percentage change, \( \xi \) is a demand elasticity and \( \xi \) a supply elasticity, the subscripts refer
to the price that is changing, and the superscripts the good under consideration (e.g., \(\zeta^c_{PB}\) is the own price elasticity of demand for B consumer goods). Similarly for B capital services we have:

\[
(92) \quad \frac{dE^d}{dK_B} = K_B \hat{\zeta}^B_K \left[ \frac{K_B}{\zeta^c_{PB}} - \frac{K_B}{\zeta^c_{PB} - 1} \right] + K_B \hat{\zeta}^A_K \left[ \frac{K_B}{\zeta^c_{rB}} - \frac{K_B}{\zeta^c_{rB} - 1} \right] = 0
\]

Solving for \(\hat{\zeta}^B_B\) and \(\hat{\zeta}^A_B\), as in equations (390) and (401) of Appendix E, we find that although we would expect both \(\hat{\zeta}^B_B\) and \(\hat{\zeta}^A_B\) to be positive as a result of the increase in demand for B consumer goods they may be negative under certain unusual conditions((399)-(401)). Let us assume that \(\hat{\zeta}^B_B\) and \(\hat{\zeta}^A_B\) are both positive for the remainder of this example.

Now if the B goods markets are able to clear but A goods prices and the wage rate are fixed we find that the change in the level of excess demand for labor is (from equation (390)):

\[
(93) \quad \frac{dE^d}{d\lambda} = \hat{\zeta}^B_B \left[ \lambda^A_B \zeta^A_B + \lambda^B_B \zeta^B_B \right] - \lambda^B_B \left[ \frac{\zeta^A_B \lambda^A_B}{\zeta^A_B - \lambda^A_B} \right] + \hat{\zeta}^A_B \left[ \lambda^A_B \zeta^B_B + \lambda^B_B \zeta^A_B \right] > 0
\]

We see that if the labor market was initially in equilibrium we may now be in a state of excess demand or excess supply.
The change in \( P_B \) and the change in \( r_B \) both contribute to changes in the level of excess demand for labor. First as a result of the increase in \( P_B \) there is an increase in demand for labor in the B goods sector and a decrease in the demand for labor in the A goods sector, thus

\[
\ell_A \zeta_{P_B} < 0 \text{ and } \ell_B \zeta_{P_B} > 0. \]

This may be a shifting of labor from one sector to another which is exactly offsetting, leaving the total demand for labor (in both sectors combined) unchanged, or it may result in excess demand or supply. In addition however, the increase in \( P_B \) also leads to a decrease in the supply of labor (as households perceive the real wage to be falling). The net effect of a change in \( P_B \) may be to generate excess demand or excess supply or even leave the level of excess demand unchanged.

In addition to the change in \( P_B \), there is also a positive change in \( r_B \) which generates changes in the level of excess demand for labor. If \( \frac{\partial \chi_A}{\partial r_B}, \frac{\partial \chi_B}{\partial r_B} < 0 \) as we assumed earlier (and in Chapter 4) we see that both \( \zeta_{r_B}^A \) and \( \zeta_{r_B}^B \) are negative and the increase in the price of B capital services leads to a decrease in the demand for labor (and no supply effect). (One can also imagine B capital services and labor as being substitutes in the production process. In such a case there would be an increase in the
demand for labor.) We can see that the net effect of both $P_B$ and $r_B$ is clear from equation (93) but that it crucially depends upon the own and cross price elasticities of demand and supply and the initial distribution of labor between the A and B goods sectors. One possibility we can consider is that planners can actually control the level of employment in the A goods sector, as well as A goods prices and the wage rate; then $\zeta_{PB}^A, \zeta_{rB}^A = 0$. The level of employment in the A goods sector is constant and all changes in employment occur in the B goods sector. In this case the first term clearly indicates an increase in excess demand for labor and the second term indicates (if $\zeta_{rB}^B < 0$) a decrease in excess demand. If B capital services and labor are substitutes to any degree (or unrelated) in production (so that $\zeta_{rB}^B \geq 0$) then the net effect of an exogenous increase in demand for B consumer goods will be an increase in the level of excess demand for labor.

In the A goods sector, equations (391) and (393) indicate that there will generally be excess demand in both the A consumer goods market and the A capital services market. In the A consumer goods market we have:
(94) \[ E^d_{c_A} = c_A \hat{P}_B \left[ \xi_{PB}^{c_A} - \xi_{PB}^{c_A} \right] - c_A \hat{r}_B \xi_{rB}^{c_A} > 0 \]

If we assume A and B consumer goods are substitutes (or even unrelated in consumption) the increase in \( P_B \) will cause an increase in the excess demand for A consumer goods. As \( P_B \) increases, consumers demand less B consumer goods and more A consumer goods. At the same time enterprises switch from the production of A consumer goods to the production of B consumer goods (if possible). In addition, there is a further decrease in the supply of A consumer goods as \( r_B \) increases (since \( \xi_{rB}^{c_A} < 0 \)). Overall the excess demand for A consumer goods will increase. Only if A and B consumer goods are complements in consumption \( (\xi_{PB}^{c_A} < 0) \) and the decrease in demand, which would result from an increase in \( P_B \), is large enough to offset the decrease in supply, would excess demand lessen. (Again, if planners can strictly control the actual levels of output of A goods as well as their prices, then \( \xi_{PB}^{c_A} = \xi_{rB}^{c_A} = 0 \).

In this case only the households' change in demand for A consumer goods determines the level of excess demand.)

From equation (393) of Appendix E we have:

(95) \[ dE^d_{x_A} = K_A \hat{P}_B \left[ \xi_{PB}^{K_A} - \xi_{PB}^{K_A} \right] + K_A \hat{r}_B \left[ \xi_{rB}^{K_A} - \xi_{rB}^{K_A} \right] > 0 \]
The increase in the price of B consumer goods causes an increase in demand for inputs, and thus $\xi_{PB}^{K_A} > 0$. If producers can switch from the production of A capital services to B consumer goods then we would expect there to be a decrease in supply of A capital services as $P_B$ increases. If they cannot switch production then there will be no impact upon the supply of A capital services. Thus $\xi_{PB}^{K_A} \leq 0$ and the first term of (95) indicates that the increase in $P_B$ increases the excess demand for A capital services.

The increase in the price of B capital services may also influence the demand and supply of A capital services. In general we would expect the demand for A capital services to increase as the price of B capital services increases if they are substitutes to any degree in production. Thus $\xi_{RB}^{K_A} > 0$. (Note if A and B capital services are not substitutes then $\xi_{RB}^{K_A} \leq 0$.) The supply of A capital services decreases as the price of B capital services increases so $\xi_{RB}^{K_A} < 0$. The change in $r_B$ then also increases excess demand for A capital services. (If A and B capital services are not substitutes and are not unrelated in production, then
\( K_A \) \( \zeta_{r_B} < 0 \) and the effect of \( \hat{r}_B \) depends on the sizes of 
\( K_A \) and \( \zeta_{r_B} \).

In general, then we see that an exogenous increase in the demand for B consumer goods leads to an increase in the excess demand for A capital services. If we assume that planners can also fix the levels of output of A capital services then the supply elasticities in (95) are zero and the change in excess demand depends only on the elasticities of demand \( \zeta_{P_B} \) and \( \zeta_{r_B} \).

In the money market we have from equation A.5.19:

\[
(96) \quad dE_m^d = \hat{P}_B \left[ m \xi_{P_B}^m + e \xi_{P_B}^e \right] + e \hat{r}_B \xi_{r_B}^e - P_B dC^d > 0
\]

Since we have assumed that there is no change in government policy, and consequently no change in the creation of money by the central authorities, the only change that results is due to changes in the demand for currency and deposits. In addition to the decrease in demand for money equal to the increase in demand for B consumer goods (-\( P_B dC^d \)), we see that the increase in the price of B consumer goods decreases the demand for cash balances (\( \xi_{P_B}^m < 0 \)). At the same time the increase in \( P_B \) increases the demand for enterprise deposits (\( \xi_{P_B}^e > 0 \)) so there is a flow of money
from cash holdings of households to enterprise deposit holdings by enterprises. The net impact of the increase in $P_B$ alone may be positive or negative and depends upon the size of the elasticities and the initial stocks of cash balances and enterprise deposits. In addition to the change in $P_B$, $r_B$ increases and the demand for enterprise deposits falls. However, sales of $B$ capital services increase the demand for enterprise deposits by the selling enterprise by exactly the same amount and thus the net effect of the change in $r_B$ on the aggregate demand for enterprise deposits is zero. As a result, there may be either excess supply or demand for money due to $P_B$ alone.

We see then, that the increase in demand for $B$ type consumer goods results in (1) disequilibrium in the labor market (either excess demand or supply), (2) disequilibrium in the $A$ goods markets (excess demand), (3) disequilibrium in the money markets (either excess demand or supply). From equation (75), the aggregate budget constraint, it is clear that when there is excess demand for labor (equation (93) is positive) then there must be an excess supply of money (equation (96) is negative). In any case (if equations (93) and (96) are both negative or one negative and the other positive) the excess demands for labor and money must offset the excess demands for $A$ type goods so that the sum of the excess demands must be zero (the sum of equations (91) to (96)).
After all the initial price changes have taken place, leading to excess demand for A goods and a corresponding excess supply in the labor and money markets, will the economy be able to return to equilibrium? There are several adjustments which could take place in the following periods which may lead to an equilibrium. The first is the change in money balances which occurs as a result of the desire to decrease \( m^d \). It is clear that as a result of the increase in the price of B consumer goods and the increased purchases of them, household expenditures have increased and \( m^d \) has decreased. However, now households face a situation of excess demand for A consumer goods. If there is no excess demand for labor (\( dE^d_\lambda = 0 \) in equation (93)) then households are faced with an excess flow supply of currency indicating that their stock of money balances will still be greater than desired, and they will attempt to spend more, simply aggravating the excess demands. If there is excess demand for labor (\( dE^d_\lambda > 0 \) in equation (93)) then there is an excess supply of money which enterprises will be holding (and they cannot purchase additional labor or A capital service inputs). If there is excess supply of labor then there may be either an excess demand or supply for money and the same conditions will result. In any case the change in the stock of money balances alone will not return the economy to equilibrium. The government must adjust \( w, r_A, P_A, g_s \), and \( \alpha \) to return to equilibrium.
It is clear from the six excess demand equations that allowing $w$, $r_A$, and $P_A$ to adjust according to market pressures would be enough to restore equilibrium. Casual evidence indicates that these prices and wages remain fixed for rather long periods of time, that excess demand for A goods and labor is relatively persistent and as a result, there is some nonprice rationing in Poland and most CPEs.

Another example which leads to excess demand for consumer goods is simply a change in demand for A type consumer goods by households with a corresponding desire to decrease the demand for household money balances. Since the price of A consumer goods is fixed there is no increase in supply and consumers cannot decrease their money holdings (unless they choose to work less). In this case we remain in a situation of excess demand for consumer goods and excess supply of household money. A-type consumer goods then must be rationed by some nonprice mechanism.

In summary we have seen that in both cases an exogenous change in household behavior (an increase in demand for household currency) leads to disequilibrium in the economy. There is excess demand in the goods market (for A goods) and the potential for excess demand in the labor market (there may be either excess demand, excess supply, or neither), and a corresponding excess supply in the money market. Even though the prices of B goods adjust a new equilibrium is not attained since the prices of A goods are fixed. Equilibrium in all markets may be achieved if central
planners adjust A good prices or the control parameters accordingly. If planners are reluctant to do so the economy will remain in a state of disequilibrium. As a result the actions of both households and enterprises, when their desired purchases cannot be made, should be examined. That is, given that households cannot purchase the amount of consumer goods they desire, and enterprises cannot purchase the amount of labor (or A capital services) they desire, what will be the resulting level of output and employment, compared to the case when markets are allowed to clear? In the remainder of this chapter this question is addressed.

5.2 Household Behavior Under Excess Demand for Commodities

The allowance for trading under nonmarket-clearing conditions has two implications. First, since there is no automatic equivalence of supply and demand, quantities cannot be determined by market clearing conditions alone. We continue to assume that households and enterprises trade voluntarily (perhaps with the exception of some A goods which we will not consider). In general neither can be forced to buy more than it demands or sell more than it supplies. Only through changes in control parameters ($\alpha, \gamma_p, \gamma_s$) and prices ($p_A, p_B, w$) can supply and demand be altered by the state.

A second major implication of trading under nonmarket-clearing conditions is that households and enterprises will
not act as if they can buy or sell any amount they demand or supply at the existing wage and price level. Since the markets may not clear, the actual amounts transacted diverge from the quantities supplied or demanded. Each individual actor then takes the quantity transacted as a constraint on its behavior. We define the supply and demand functions which we have derived above, when there are no constraints on how much the actors can buy or sell, as the notional supply and demand functions. These functions outline what the actors would do if all markets were able to clear. On the other hand, if the economy is in a nonmarket clearing situation, and the actors are constrained, these notional supply and demand functions may not describe their actions. The new supply and demand functions which take into account the additional constraints of the excess demands are called the effective supply and demand functions. The actual quantities exchanged are no longer found by the equilibrium values of the notional supply and demand curves but by the interaction of the effective supply and demand curves.

To illustrate the effects of sticky or fixed prices on the behavior of households and enterprises in our hypothetical MCPE let us re-aggregate and consider one type of consumer good for which the price is too low to clear the market and one type of labor for which the wage rate is too low to clear the labor market. That is, we shall
consider the basic model of Chapter 4 under nonmarket clearing conditions. Then we shall return to discuss the intersectoral aspects.

If the price level is such that there is excess demand in the commodity market then total purchases of commodities, \( y^d \), will be less than notional demand, \( y^d = c^d + k^d + g^d \). The representative household cannot purchase the quantity of consumer goods which it demands \( (c^d) \). Instead, actual purchases are \( c = y^s - (k^d + g^d) < c^d \). \( c \) is now a supply determined constraint on the household's utility maximization. The household acts as a quantity taker with respect to consumption as well as a wage and price taker.

The household has two choices, or some combination of them. First, it can continue to accept employment equal to its notional supply, \( \ell^s \). The household then maintains the same level of notional income and saves that amount which it would like to spend on consumer goods but can't. This increases the demand for household cash during the constrained period. A second option the household has is to reduce the amount of labor services offered and substitute leisure for the consumption it can not obtain. The combination of these two options which the household takes in order to maximize utility yield the effective labor supply \( (\ell^s) \) and the effective household cash demand \( \left( \frac{M}{P} \right)^d \). Together they also imply a future effective consumption demand \( (c^d) \), once the constraint is lifted.
We shall assume that households are initially constrained, and expect to be constrained, from 0 ≤ t < \( \hat{N} \) and that they expect not to be constrained from \( \hat{N} \) to \( N \). Further we shall assume that the time of retirement \( N^* \) falls between \( \hat{N} \) and \( N \). We consider this case only because it is the most general. If \( N^* \) falls before \( \hat{N} \) the effective labor supply, which we derive below, has the identical form. Since \( \lambda = 0 \) for \( t > N^* \) however, this changes the level of the effective consumer goods demand and the effective demand for money from \( N^* < t \leq \hat{N} \) and \( \hat{N} < t \leq N \). It does not, however, change the functional form. Similarly, if \( \hat{N} = N \) the households are constrained during their entire lifetime. There is no effective consumer goods demand as a result since \( c \) prevails during the entire period under consideration.\(^4\)

Now assuming households are constrained from 0 ≤ t ≤ \( \hat{N} \) and \( \hat{N} < N^* < N \), the representative household then attempts to maximize an intertemporal utility function which depends upon the current constrained consumption, \( c \), and the expected future constraint.\(^5\) In this case we see that the expected future shortage (\( c - c^d \)) is greater the greater the current shortage, but households do expect to be unconstrained at some time in the future.

Households also have an initial stock of money balances:

\[ \Omega = \frac{M(0)}{P} \quad (6) \]
Although some households may be constrained more than others, the representative household attempts to maximize an intertemporal utility function specified as:

\[
U = \int_0^N u(c, \xi^s(t), g_p) \, dt \\
+ \int_0^\hat{N} u(c^d(t), \xi^s(t), g_p) \, dt \\
+ \int_0^{N^*} u(c^d(t), 0, g_p) \, dt,
\]

subject to given values of \( w, p, \tilde{N}, g_p, \hat{N}, N^*, N, \) and \( c \) and an asset exhaustion condition (equation (100) below). The household's life plan now involves three subperiods (rather than two): \( 0 \leq t \leq \hat{N}, \hat{N} < t \leq N^* \), and \( N^* < t \leq N \).

Savings, or the flow demand for household cash, for the three periods now becomes:

\[
\frac{1}{P} \left( \frac{dM^d}{dt} \right) = \begin{cases} \\
\frac{w^s}{P} + (b - T) - c & 0 \leq t \leq \hat{N} \\
\frac{w^s}{P} + (b - T) - c^d & \hat{N} < t \leq N^* \\
- c^d & N^* < t \leq N 
\end{cases}
\]

Again, as in Chapter 4, we assume no utility is gained for holding assets after death so optimal behavior entails exhausting all assets by \( t = N \). The choice of \( S^s(t) \) and \( c^d(t) \) must satisfy the asset exhaustion conditions:
\[(100) \quad \frac{M(N)}{P} = \frac{M(0)}{P} + \int_0^N (b - T) \, dt + \frac{w}{P} \int_0^N \phi_s(t) \, dt \]

\[- \hat{N}c - \int_{\hat{N}}^N c^d(t) \, dt = 0\]

In reality there are two problems with the form of equation (100). One is actually measuring \(\phi_s\). It may be that workers continue to work, or appear at their place of employment just as much as if they were not constrained. Rather than working less in terms of hours on the job they may choose, for example, to take longer breaks, actually perform fewer tasks, etc. These actions may not appear in labor force statistics and the measuring of \(\phi_s\), as opposed to \(\phi\), may be difficult. The other problem is the desire and/or ability for households to exhaust their stock of assets at \(t = N\). It is reasonable to expect that due to high inheritance taxes and the previous strict controls on bequests, that households do not attempt to hold a very large amount of assets at \(t = N\). The assumption that they attempt to exhaust all their assets is made to simplify the analysis.

The maximization of (98) subject to (100) yields an optimal path for \(\phi_s\), \(0 \leq t \leq N\), and for \(c^d\), \(\hat{N} < t \leq N\). If consumption and employment are independent influences on utility (\(U_{kc} = 0\)), \(\phi_s\) is constant for \(0 \leq t < \hat{N}\) and for \(\hat{N} \leq t \leq N\) but at different levels and \(c^d\) is constant for
\[ \hat{N} \leq t \leq N. \quad (7) \]  
In addition, the asset exhaustion condition above simplifies to:

\[ \frac{M(N)}{P} = \frac{M(0)}{P} + N'(b - T) + N'w\frac{S'}{p} - \hat{N}c - (N - \hat{N})c^d = 0 \]  

Then, given the savings specification (equation (99)) the determination of \( l^S \) and \( c^d \) also imply values of \( \frac{m^d}{p} \) for all three periods.

Now let us compare, for given values of \( \Omega, \frac{w}{p} \), and the other exogenous variables, the values of \( l^S, c^d \), and \( \frac{m^d}{p} \) obtained here with the values of \( l^S, c^d \) and \( \frac{m^d}{p} \).

Given that \( c < c^d \) for \( 0 \leq t \leq \hat{N} \) the household is spending less than the notional level which it would have chosen, \( (c^d) \), in the equilibrium model of Chapter 4. This reduction in expenditures is absorbed in two ways. First, the household reduces the amount of labor services offered during its entire lifetime. Thus, for \( 0 \leq t \leq N' \) the average level of \( l^S \) is less than the average level of \( l^S \). Second, the household increases its consumption during the future, unconstrained, years so that the average level of \( c^d \) is greater than the average level of \( c^d \) for \( \hat{N} < t \leq N \).

The decrease in total lifetime employment implies \( l^S \) is less than \( l^S \) during each of the two working subperiods. However, even though \( l^S' < l^S \) for \( 0 \leq t \leq \hat{N} \), the difference between \( \frac{w}{p}l^S \) and \( \frac{w}{p}l^S' \) is less than the difference between \( c^d \) and \( c \). This is because the difference between desired and
actual expenditures \((c^d - c)\) is spread over \(N'\) years of reduced wage income. Further \(c^{d'} > c^d\) for \(\hat{N} < t \leq N\) which also partially compensates for the shortfall of expenditures during the preceding period.

The relationships between the effective labor supply and consumption demand, and the notional supply and demand imply a relationship between the effective and notional demand for household cash balances. Since \(c^{d'}\) exceeds \(c^d\) for \(\hat{N} < t \leq N\) the average level of \(\frac{m^{d'}}{p}\) is greater than \(\frac{m^d}{p}\) for \(0 \leq t \leq \hat{N}\). Further, \(k^{s'}\) is less than \(k^s\) and \(c^{d'}\) is greater than \(c^d\) for \(\hat{N} < t \leq N\) so \(\frac{m^{d'}}{p}\) must be less than \(\frac{m^d}{p}\) for this period. Thus, for \(0 \leq t \leq \hat{N}\), \(\frac{m^{d'}}{p}\) must be greater than \(\frac{m^d}{p}\). The relationships between the effective and notional demands are summarized in Table 11.

Table 11: Summary of Relationships Between Effective and Notional Supply and Demands for Households

\[
0 \leq t \leq N: \quad c < c^d, \quad k^{s'} < k^s, \quad \frac{m^{d'}}{p} > \frac{m^d}{p}
\]

\[
\hat{N} < t \leq N': \quad c^{d'} > c^d, \quad k^{s'} < k^s, \quad \frac{m^{d'}}{p} < \frac{m^d}{p}
\]

\[
N' < t \leq \hat{N}: \quad c^{d'} > c^d, \quad k^s = 0, \quad \frac{m^{d'}}{p} < \frac{m^d}{p}
\]

Households, then, are seen to respond to the constraint on current consumption by: 1) increasing future consumption, and 2) decreasing their supply of labor services.
The increase in future consumption associated with an increase in current savings is simply forced savings. This aspect has been considered by many authors.

The possibility of a reduction in the labor supply (an increase in leisure) is a rather unique aspect, first considered by Barro and Grossman [14], [15], [16], for market-type economies. Although the possibility of traditional employment effects of foreign trade disturbances has been considered by Holzman [101] it has only been recently that the labor force disincentive effects of disequilibrium have been explicitly considered. Both Portes [171], [172] and Brada [29] have considered these problems for a centrally planned economy, but not in great detail, as mentioned in Chapter 2. These effects must be considered explicitly since generalized excess demand and persistent excess demand in certain markets continue to be problems in Poland. Barro and Grossman [16] note that the inclusion of the option for households to reduce their labor supply implies that excess demand in the commodity market and the labor market can actually result in a lower level of employment and output than the equilibrium levels. This shall be examined in section 5.4 below for the hypothetical MCPE.

The maximization of U yields values of $l^S$ and $\frac{m^c}{p}$ which may be expressed as:
(102) \[ \lambda^s = \lambda^s(\Omega, \frac{w}{\lambda}, g, c) \]
\[ + \frac{d^s}{p} \]
(103) \[ \frac{m^d}{p} = \frac{m^d}{p} (\Omega, \frac{w}{p}, g, c), \]
\[ + \frac{d^s}{p} \]

where again the signs under the variables are the signs of the partial derivatives. The signs may be verified in the same manner as those in Chapter 4. For all \( N \) periods the problem is to maximize:

(104) \[ L = U(c, \lambda, g) + \lambda[\Omega + a^s(b - T) + N \frac{w^s}{p} - c] \]

The problem is more manageable and the signs are more evident if we consider each of the three subperiods separately. In each of the \( N \) periods within the first subperiod (0 ≤ \( t \leq \hat{N} \)) the representative household maximizes:

(105) \[ L = U(c, \lambda, g) + \lambda[\Omega + (b - T) + \frac{w^s}{p} - c]. \]

c was a choice variable to be maximized out in the problem of Chapter 4. Now, however, it is a constraint on household behavior.

For the second period (\( \hat{N} < t \leq N^r \)) we have:

(106) \[ L = U(c, \lambda, g) + \lambda[\Omega + (b - T) + \frac{w^s}{p} - c^d^r]. \]

And for the last subperiod (\( N^r < t \leq N \)) the problem is to maximize:

(107) \[ L = U(c, \lambda, g) + \lambda[\Omega + (b - T) - c^d^r]. \]
In all three cases the problem is identical to that of the households in equilibrium in Chapter 4 and the signs of $\Omega$, $\frac{w}{p}$, and $g_p$ are identical. In the first period however, the constraint on consumption enters the problem. Current consumption enters both the labor supply and money demand functions, having an impact similar to that of $(b-T)$ when bonuses and taxes were exogenous in Section 4.6.

An increase in $c$ would immediately decrease $\frac{m_d}{p}$ as households increase their consumption (since $c < c^{d'}$). In addition they would increase the amount of labor services offered in order to purchase the higher level of current consumption and the higher level of future consumption ($c^{d'} > c$ from the constraint on periods before $dc$).

The net effect upon the current effective demand for money may be positive or negative. From equation (99) we see there is a direct effect ($-c$), due to the increased consumption, which decreases $\frac{m_d}{p}$ and an indirect effect, $(\frac{M^Ls}{p})$ due to the increase in income, which increases $\frac{m_d}{p}$.

In the effective labor supply function there is a substitution effect and an income effect for changes in $\frac{w}{p}$ given $\Omega$, and $g_p$. We assume, as in Chapter 4, that the substitution effect outweighs the income effect in the relevant range: the net effect of an increase in $\frac{w}{p}$ is to raise $L^S$.

Substitution between leisure and consumption
is limited, though, to increasing \( c^d \) during the future unconstrained years. The substitution effect of \( \frac{W}{P} \) on \( l^s \) must then be weaker than the substitution effect of \( \frac{W}{P} \) on \( l^s \). However, an increase in \( \frac{W}{P} \) still raises current income, \( \frac{W}{P} l^s \) (even if the increase in \( l^s \) is negligible) and thus increases future \( c^d \) and current \( \frac{m^d}{P} \), since current expenditures, \( c \), are fixed.

In addition to \( \frac{W}{P} \), \( e_p \), \( c \), \( \hat{N} \) the length (or expected length) of the period in which households will be constrained (\( \hat{N} \)), has a quantitative (but not qualitative) impact upon the effective demand and supply functions. If the number of years for which the household is constrained increases from \( \hat{N} \) to \( \hat{N}_2 \), say, this decreases the number of years during which the household can obtain \( c^d \). Since \( c \), the constrained level of consumption, is less than \( c^d \) during \( \hat{N} \), and now during (\( \hat{N}_2 - \hat{N} \)) as well, there is an increase in the household's disposable lifetime resources by the amount (\( \hat{N}_2 - \hat{N} \))(\( c^d - c \)). The household will lower total lifetime employment and increase consumption in the unconstrained years, accordingly. Thus \( l^s \) will be lower for \( 0 \leq t \leq \hat{N} \) when \( \hat{N}_2 \) holds (compared to \( l^s \) when \( \hat{N} \) holds) and \( c^d \) will be greater for \( \hat{N}_2 \leq t \leq \hat{N} \)
(than \( c^{d'} \) for \( \hat{N} < t < N \)). The decrease in \( k^S \) also implies a decrease in \( \frac{m^{d'}}{P} \) for \( 0 \leq t \leq N' \).

In general then, the longer the anticipated constraint \( (\hat{N}) \) the larger is the household's response to any given shortfall in the availability of consumer goods \( (c^d - c) \) in terms of decreasing the effective labor supply and the smaller in terms of increasing the effective money demand.\(^9\)

For retired households there is no possibility for the substitution of leisure for the currently desired but unobtainable consumption. Thus, they increase current \( \frac{m^{d'}}{P} \) and future \( c^{d'} \) as a result of the shortfall of \( c \) below \( c^d \). The directions of the effects of \( \Omega, c, \) and \( g_p \) upon \( \frac{m^{d'}}{P} \) and \( c^{d'} \) are the same as those for the working households.

Figure 9 below, follows the Barro and Grossman format and illustrates graphically the relationships between \( k^S', k^S, \) and \( k^d \). (Portes [172] derives a similar labor supply function for a centrally planned economy but in a quite different model which attempts to explain planners' behavior as well, as explained in Chapter 2.) In Figure 9 below, the \( k^d \) curve and the two \( k^S \) curves are identical to those of Figure 5. For simplicity let us consider only changes in \( \Omega \) and \( \frac{w}{P} \), assuming \( \alpha, \frac{r}{P}, g_s \) and \( g_p \)
are constant. The \( l^d \) curve intersects \( l^s(\Omega^*) \) at a point E corresponding to the equilibrium level of wealth, real wage and employment. The \( l^s(\Omega_2) \) curve corresponds to a larger value of nonwage wealth, \( \Omega_2 > \Omega^* \), brought about by a price level less than \( P^* \). At real wage \( \left( \frac{W}{p} \right)^* \), \( (P = P^*) \) the notional demand for labor is greater than the notional supply corresponding to \( \Omega_2 \).

The curve denoted \( l^s(\Omega_2)|_c \) depicts the effective supply of labor services for nonwage wealth \( \Omega_2 \), and a level of consumption \( c \) (brought about by \( P < P^* \)). \( l^s(\Omega_2)|_c \) coincides with \( l^s(\Omega_2) \) when \( c \) is not an effective constraint, \( c \geq c^d(\Omega_2, \frac{W}{p}, \varepsilon_p) \), but when \( \frac{W}{p} \) is such that \( c \) is a binding constraint, \( c < c^d(\Omega_2, \frac{W}{p}, \varepsilon_p) \), then \( l^s \) lies to the left of \( l^s(\Omega_2) \). In Figure 9 real wage \( \left( \frac{W}{p} \right)_B \) is such that \( c = c^d(\Omega_2, \left( \frac{W}{p} \right)_B, \varepsilon_p) \) and all real wage levels above that imply \( c < c^d \) and there is a divergence between \( l^s \) and \( l^s \cdot l^s \) is upward sloping, reflecting the assumption that \( \frac{\partial l^s \cdot l^s}{\partial W/p} > 0 \), i.e. the substitution effect outweighs the income effect even for the effective labor supply function.

Note that the effective supply curve is graphed with the notional demand for labor. This assumes that the enterprise continues to offer to purchase labor services according to its notional demand function even though it is constrained in its purchases. There are several
alternatives which the enterprise may pursue which we shall not consider. For example, enterprises may offer to purchase more than they notionally demand if they think actual transactions are related to offers, or they may not make offers to purchase if the offers are not expected to be successful and there are costs involved with making an offer. (10)

5.3 Enterprise Behavior Under Excess Demand for Labor

In the market clearing case of Chapter 4 the supply of commodities was described as

\[ y^S = y^S \left( \frac{y}{P}, \frac{r}{P}, g_s, \alpha \right) \]
Now, however, let us assume that there is excess demand in the labor market. That is, the average real wage in both sectors, \( A \) and \( B \), is below the equilibrium rate \( \frac{\mathbf{w}}{\mathbf{p}}^* \), as a result of planners' behavior or wage and price rigidity. The average real wage may be at the equilibrium level in either of these sectors, excess demand will exist in the aggregate if there is excess demand in one sector, limited factor mobility, and limited substitution among types of goods which enterprises may produce. Here we shall consider only the case of generalized excess demand. Given that \( \ell < \ell^d \) the representative enterprise, or enterprises in general, act as quantity takers on the labor market, as well as a price taker. The level of employment and output is then supply-determined.

The MCPE enterprise now maximizes \( \ell \), the same objective function, by producing as much output as possible with the available labor. This output is denoted as \( y^S \), and termed the effective supply of output. The enterprise's problem is to choose \( y^S \) so that in each period

\[
L_t = (1 - \alpha)\Pi_t^* + \alpha VA_t
\]

is maximized subject to the constraints of Chapter 4, (32) or (33):

\[
E_t + (y_t^S - \frac{w_t}{p_t} + \frac{\mathbf{R}_t}{\mathbf{p}_t}) - b > 0
\]
(111) \[ e^d_t = \Pi_t - b_t, \text{ or} \]

(112) \[ e^d_t = y^S_t - (1 + \beta(VA_{t-1})) \cdot \frac{W_t}{p} - \frac{r}{p} \cdot k^d_t \]

and the constraint on the labor supply

(113) \[ y^S_t = \phi(\ell_t, k^*_t), \quad 0 \leq t \leq \hat{N}, \]

where \( \ell_t \) is fixed and less than \( \ell^d \). The constraint of \( \ell < \ell^d \) implies \( y^S < y^S \) with \( y^S \) approaching \( y^S \) as \( \ell \) approaches \( \ell^d \). In addition, the enterprise will substitute capital for labor, increasing the demand for capital inputs. This new demand for capital inputs is denoted \( k^d^* \).

Figure 10 duplicates that portion of Figure 1 pertaining to the MCPE enterprise maximizing a combination of profit and value added. (We ignore the constraints on enterprise deposits and the flow of deposits, assuming they are not binding, for simplicity and purposes of comparison). The enterprise, if not constrained on the labor market, would have operated at point C: \( y^S_p, \ell_p, k_p \).

Now, however, with the amount of labor available set at \( \ell < \ell^d = \ell_p \) the enterprise may operate along the locus \( \ell_p\tilde{y}_k \). The enterprise will operate at point B, \( (y^S_2, \ell, k_p) \), if there is no possibility of purchasing additional capital inputs with the newly available funds (as a result of the unavailable labor). The enterprise will operate at point A, \( (y^S, \ell, k^d^*) \), if there is a possibility of purchasing more capital with the newly available funds.
The net result at point A would be a decrease in the amount of output produced (relative to point B) and an increase in the amount of capital inputs hired as a result of the lower level of employment.

Equation (108) indicates that for the enterprise which can purchase as much labor as it desires, the supply of commodities is a function of the real wage, the price of capital inputs, government subsidies, and the planners' weight on value added. Now, however, it is clear that the supply of output by enterprises may vary even if all four of the arguments in (108) are fixed. That is, as $l$ changes, point A moves along $l \perp k_1$. Thus, the effective supply of commodities may be written as:

\[ (114) \quad y^s = y^s(l, \frac{r}{p}, \xi, \alpha) \]
In addition the effective demand for capital inputs may be written as:

\[(115) \quad k^d = k^d_0(\ell, \frac{r}{p}, g_s, \alpha) \geq 0\]

Equation (112) also implies an effective demand for enterprise deposits which may be written as:

\[(116) \quad e^d = e^d_0(\ell, \frac{r}{p}, g_s, \alpha) \geq 0\]

Figure 11 illustrates the commodity market when there is excess demand for labor. The \(y^s\) and \(y^d\) curves are identical to those of Figure 6 and point E is the equilibrium point denoting the optimal values of the real wage \((\frac{w}{p})^*\) and level of output \(y^*\). At real wage \((\frac{w}{p})_A\), \(\ell = \ell^d\).

When the real wage is less than \((\frac{w}{p})_A\) there is excess demand for labor and a divergence between the effective and notional supply of commodities and the effective and notional demand for capital inputs. The effective supply of output is \(y^s(\ell, \frac{r}{p}, g_s, \alpha)|_{\ell < \ell^d}\). The supply of commodities is independent of the real wage when the real wage is below \((\frac{w}{p})_A\) and thus is perfectly inelastic. The effective demand for commodities includes the demand for consumer goods as well as capital inputs, and is still responsive to the wage rate but to a lesser degree. The effective demand for output may be represented by:
\[
\frac{w}{p} = y^* \\
\left(\frac{w}{p}\right)_A \\
\left(\frac{w}{p}\right)^* \\
y^* \\
y^*_1 \\
y_1 \\
y \\
y^d = \frac{d}{r} + \frac{w}{p} + \varepsilon_s + \alpha + \Omega = c^d + k^d + \varepsilon^d
\]

Figure 11. Effective Supply of Goods

(117) \( y^d = y^d(r, \frac{w}{p}, \varepsilon_s, \alpha, \Omega) = c^d + k^d + \varepsilon^d \)

The enterprise, maximizing its objective function with a fixed amount of labor, then offers \( y = y^s \) for any given real wage below \( \left(\frac{w}{p}\right)_A \). In Figure 11 the actual amount of output transacted is determined by the \( y^s \) curve. At real wage \( \left(\frac{w}{p}\right)^* \) output is determined at point A, and is \( y \). The difference between \( y \) and \( y_1 \) is the level of excess demand in the goods market.

5.4 The Determination of Output and Employment under Conditions of General Excess Demand

When a particular market is experiencing excess demand, voluntary exchange implies the actual level of transactions
will be supply determined. We saw in sections 5.2 and 5.3 that when the commodity market or the labor market is experiencing excess demand an effective supply which is less than the notional supply prevails in the other market. Thus when there is excess demand in both markets the effective supplies of commodities and labor services determine both the level of output and employment. Output is determined by

\[ y = y^s(\ell, \varepsilon_s, \frac{r}{p}, \alpha) < c^d(\Omega, \frac{w}{p}, \varepsilon_p) \]

\[ + k^d(\frac{r}{p}, \frac{w}{p}, \alpha) + \varepsilon_d. \]

Employment is determined by

\[ \ell = \ell^s(\Omega, \frac{w}{p}, \varepsilon_p, c) < \ell^d(\frac{w}{p}, \Omega, \varepsilon_s). \]

For (118) and (119) to hold, the wage-price vector must be such that there is excess demand in both markets. Conditions (118) and (119) determine unique levels of output and employment.

Consider a partial equilibrium example in which \( \frac{r}{p} \) and \( k \) are fixed and the exogenous variables \( \varepsilon^d, \varepsilon_p, \varepsilon_s, M, b, T, \alpha, N, N' \), and \( \hat{N} \) are given along with an appropriate wage-price vector. Equation (119) implies a current value for \( \ell \) such that \( \ell^s = \ell \). Then with \( \ell \) determined, equation (118) relates \( y \) to \( \ell \). To illustrate the determination of \( y \) and \( \ell \) suppose that initially the wage-price vector is equal to \( w^*, p^* \), and consistent with market clearing.
Then suppose there is a permanent change in an exogenous variable (such as a decrease in \( T \) which increases \( M \)) such that \( w^*, p^* \) are increased while the actual nominal wage and price level are unchanged.

The initial effect of the disturbance is an increase in the notional demand for commodities above the notional supply and a decrease in the notional supply of labor below the notional demand as a result of the increase in \( \Omega \) (if \( M \) increased). This disturbance then creates excess demand in both markets. Since this disturbance is permanent and wages and prices do not adjust because of market inflexibility or planners' preferences, the representative working household reduces its effective labor supply below its notional supply as a result of the perceived supply-imposed constraint on its consumption. The representative enterprise sees a supply-imposed constraint on the level of labor services which it can purchase, which reduces profits and value added. As a result the enterprise reduces its effective supply of commodities below its notional supply.

These are the initial effects only. There is a multiplier effect as the reduction in the effective supply of commodities leads to increased excess demand for commodities and a further fall in the supply of labor services causing a further reduction in profits, value added, and as a result, a reduction in the effective supply of
commodities. This process continues until the actual levels of output and employment are determined somewhere below the general market clearing levels.

The outcome can be determined by differentiating equation (119) to get:

\[
(120) \quad dl = \frac{\partial ls'}{\partial \Omega} \cdot d\Omega + \frac{\partial ls'}{\partial w_p} \cdot dw_p + \frac{\partial ls'}{\partial g_p} \cdot dg_p + \frac{\partial ls'}{\partial c} \cdot dc
\]

Now from equation (112) (omitting the t subscripts) and since \( c = y - k^d - g^d \) we have:

\[
(121) \quad c = e^d + (1 + \beta(VA)) \frac{w_p}{e^d} - g^d
\]

Substituting into (120) we have:

\[
(122) \quad dl = \left[ \frac{\partial ls'}{\partial \Omega} \cdot d\Omega + \frac{\partial ls'}{\partial w_p} \cdot dw_p + \frac{\partial ls'}{\partial g_p} \cdot dg_p \right] + \left[ de^d + (1 + \beta(VA)) \cdot \frac{w_p}{e^d} + (1 + \beta(VA)) \frac{dl - dg^d}{e^d} \right] \frac{\partial ls'}{\partial c}
\]

The second bracketed term is an equivalent expression for \( dc \), which generates a change in the effective labor supply, \( \frac{\partial ls'}{\partial c} \). Rewriting, we have:

\[
\left[ 1 - (1 + \beta(VA))\frac{w_p}{e^d} \right] dl = \frac{\partial ls'}{\partial \Omega} \cdot d\Omega + \frac{\partial ls'}{\partial g_p} \cdot dg_p
\]

\[
+ \left[ \frac{\partial ls'}{\partial w_p} + \frac{\partial ls'}{\partial c} \cdot (1 + \beta(VA)) \cdot e^d \right] \left( dw_p - dg^d \frac{\partial ls'}{\partial c} + de^d \cdot \frac{\partial ls'}{\partial c} \right)
\]
\begin{align}
(123) \quad d \lambda &= \frac{l}{\left[ 1 - (1 + \beta(VA)) \frac{w}{p} \frac{\partial \lambda}{\partial c} \right]} \cdot \left[ \frac{\partial \lambda^*}{\partial \Omega} d \Omega + \frac{\partial \lambda^*}{\partial g_n} d g_p \right] \\
& \quad + \left[ \frac{\partial \lambda^*}{\partial \frac{w}{p}} + \frac{\partial \lambda^*}{\partial c} (1 + \beta(VA)) \right] \left[ \frac{d \frac{w}{p}}{d} + (d e^d - d g^d) \frac{\partial \lambda^*}{\partial c} \right]
\end{align}

Equation (123) indicates that the change in the level of employment, \(d \lambda\), will be a multiple \(\frac{l}{\left[ 1 - (1 + \beta(VA)) \frac{w}{p} \frac{\partial \lambda}{\partial c} \right]}\)

of the change in the effective supply of labor caused by a change in public expenditures \((g^p)\), government demand \((g^d)\), the real wage \((\frac{w}{p})\), wealth \((\Omega)\), and consumption during \(\hat{N}\), c. The impact of a decrease in \(c\) alone, assuming no change in government policy or wealth, \((d \Omega = 0, d g_p = 0, d g^d = 0)\), is simply:

\begin{align}
(124) \quad d \lambda &= \frac{l}{\left[ 1 - (1 + \beta(VA)) \frac{w}{p} \frac{\partial \lambda}{\partial c} \right]} \cdot \left[ \frac{\partial \lambda^*}{\partial \frac{w}{p}} + \frac{\partial \lambda^*}{\partial c} (1 + \beta(VA)) \right] \\
& \quad + \frac{d \frac{w}{p}}{d} + d e^d \frac{\partial \lambda^*}{\partial c}
\end{align}
First of all, these changes induce a direct change in the effective labor supply and employment as indicated by the large bracketed term on the right hand side of equation (124). But the decrease in employment means less output and less consumption which induces further decreases in the effective labor supply as described above. This effect is indicated by the term preceding the brackets and is termed the supply multiplier.\(^{(11)}\) The term

\[
(1 + \beta(VA)) \frac{w}{p} \cdot \frac{\partial S'}{\partial c}
\]

is positive and very likely less than one. For simplicity we assume that it is thus making the multiplier positive and greater than one.\(^{(12)}\)

In determining the level of output and employment it is not necessary to consider the effective flow demand for money (household cash plus enterprise deposits) since we can derive an economy wide budget constraint as in Chapter 4. From the household sector (ignoring the time subscripts, but speaking of the constrained period) we have:

\[
(125) \quad c + \frac{m^d'}{p} - \frac{w^s}{p} - \frac{w^d'}{p} - b + T = 0
\]

From the government sector we have:

\[
(126) \quad g^d + g_s - T - \frac{e^s}{p} = 0.
\]

From enterprises we have:

\[
(127) \quad b - y^s' + \frac{w^k}{p} + \frac{r}{p} \cdot k^d' + \frac{e^d'}{p} = 0
\]
Summing all three constraints we have

\[ (128) \quad (c + \frac{r}{p} k^{d^{'}} - \frac{\bar{w}}{p} d - y^{s^{'}}) + (\frac{\bar{w}}{p} k - \frac{w}{p} k^{s^{'}}) \]
\[ + \frac{1}{p}(m^{d^{'}} + e^{d^{'}} - e^{s}) = 0 \]

The entire model under conditions of excess demand in the commodity market and the labor market may be summarized as:

\[ (129) \quad \lambda = \lambda^{s^{'}} = \lambda^{s} (\bar{\alpha}, \bar{w}, \bar{p}, \bar{c}) < \lambda^{s} \]

\[ - + \pm + \]

\[ (130) \quad \lambda < \lambda^{d}(\frac{w}{p}, \frac{r}{p}, \bar{g}_{s}, \alpha) \]

\[ - - \leq 0 \geq 0 \]

\[ (131) \quad y = y^{s^{'}} = y^{s} (k, \frac{r}{p}, \bar{g}_{s}, \alpha) < y^{s} \]

\[ + - + + \]

\[ (132) \quad c = c^{d}(\bar{\alpha}, \frac{w}{p}, \bar{g}_{p}) \]

\[ + + \pm \]

\[ (133) \quad k = k^{d^{'}} = k^{d} (\lambda, \frac{r}{p}, \bar{g}_{s}, \alpha) \]

\[ - - - \geq 0 \]

\[ (134) \quad \bar{g}^{d} = \bar{g} \]

\[ (135) \quad y^{d^{'}} = c^{d} + k^{d^{'}} + \bar{g}^{d} > y^{d} \]

\[ (136) \quad \frac{m}{p} = \frac{m^{d^{'}}}{p} = \frac{m^{d}}{p} (\bar{\alpha}, \frac{w}{p}, \bar{g}_{p}, \bar{c}) > \frac{m^{d}}{p} \]

\[ - + \pm \]

\[ (137) \quad \frac{e^{d^{'}}}{p} = \frac{e^{d^{'}}}{p} (\lambda, \frac{r}{p}, \bar{g}_{s}, \alpha) \]

\[ \pm \pm + - \]
(138) \[ g^d + g^s = T + \frac{e^s}{P} \]

Figure 12 below illustrates the determination of output and employment when there is excess demand in both the labor market and the consumer goods market, following the method of Barro and Grossman [16]. In addition, the figure illustrates that even though the equilibrium real wage is prevailing in the economy nominal wages and prices are too low. This results in excess demand and an actual level of output and employment below the equilibrium level. The figure is drawn assuming the existing real wage is \( \frac{w}{P} \). At this real wage the notional demand for labor is \( \ell^d(\frac{w}{P}) \), and the general market clearing level of employment is \( \ell \). Further the locus labeled \( c^d(\Omega, \frac{w}{P}, \ldots) + k^d + g^d \) is the notional demand for goods and \( y \) is the general market clearing level of output prevailing at \( \frac{w}{P} \). Point E is therefore the general market equilibrium for the real wage \( \frac{w}{P} \) (and the given values of \( g^d, g^p, g^s, M, b, T, \alpha, N, N^*, \hat{N} \)). This point also corresponds to point E in Figures 9 and 11.

Now suppose that the nominal wage and price level are equiproportionately lower than \( w \) and \( p \) such that \( p = p_2 < p^* \), \( w = w_2 < w^* \), and \( \frac{w_2}{p_2} = \frac{w}{p} \), as a result, say, of a decrease in \( T \) as mentioned earlier. The locus \( c^d(\Omega_2, \frac{w}{P}, \ldots) + k^d + g^d \) is the new notional
demand as a result of the increase in household wealth, \( \Omega_2 > \Omega^* \) (due to the decrease in the price level). As a result of the increase in household wealth there is also a decrease in the supply of labor. If wages and prices can not adjust there will be excess demand in both the labor market and the goods market. Thus there will be an effective supply of labor (\( y^S \)) and an effective supply of goods (\( y^S' \)) which were derived above. The effective supply loci then determine the actual amounts of \( y \) and \( \ell \) which prevail in the economy. The locus \( y^S(\Omega, \frac{P}{P^*}, \bar{e}_S, \alpha) \) is all

![Graph](image)

Figure 12

The Determination of Output and Employment
combinations of \( y \) and \( \ell \) which satisfy equation (118).

The slope of \( y^S(\ell, \frac{r}{p}, g_s, \alpha) \) is simply the marginal product
of labor \( \frac{\partial \phi}{\partial \ell} \). The locus \( L^S(\Omega_2, (\frac{w}{p})^*, g_p, c) \) is the set of
points which satisfies equation (119) and is drawn for the
case under consideration, \( p = p_2 < p^* \), and \( w = w_2 < w^* \).

The locus \( L^S(\Omega^*, (\frac{w}{p})^*, g_p) \) is the locus satisfying (119)
when \( w = w^* \) and \( p = p^* \). The slope of these curves is
\[ \frac{\partial \phi}{\partial \ell} \cdot \frac{\partial \ell}{\partial L^S} \]
so if \( \frac{\partial \ell}{\partial L^S} > 1 \) the \( L^S \) loci are steeper than the
\( y^S \) locus. The \( L^S \) locus and \( y^S \) locus corresponding to
\( p_2, w_2 \) intersect at point A. This intersection determines
the amount of output, \( y \), and employment, \( \ell \), which results
when \( p = p_2 \), and \( w = w_2 \). This point also corresponds to
point A in Figures 9 and 11.

The differences between \( y^* \) and \( y \) and \( \ell^* \) and \( \ell \) measure
the differences between the actual levels of output and
employment and the levels possible under general market
clearing conditions. We see that the real wage consistent
with market clearing may also result in excess demand.
The excess demand arises because the price level and
nominal wage rate are too low. The persistent excess demand
results in a level of output and employment below the full
employment, equilibrium levels. This occurs because
households, perceiving the excess demand for consumer goods
as a constraint on their consumption plans, decrease their
effective labor supply. Enterprises then produce a level of output constrained, via the production function, by the available labor supply.

To return to point $E$ the full employment level of output, a rise in the real wage is not required if $p = p_2$, and $w = w_2$. The problem is the lack of incentive to work: the limited amount of consumer goods. To restore incentives an equiproporionate rise in prices and wages will suffice. If $w$ and $p$ increase proportionately the increase in $p$ decreases $\Omega$ and thus increases $l^{S'}$. The $l^{S'}$ curve in Figure 12 shifts to the right. The level of employment thus increases even if there is no increase in the real wage. Since employment, $l$, is the variable constraining output, as $l^{S'}$ increases, $y$ increases as we move up the $y^{S'}$ curve. Point $A$ then eventually shifts up to point $E$ as nominal wages and the price level are increased.

Another example of a movement from point $E$ to point $A$ is the case of a decrease in taxes financed by an increase in the money supply as discussed in Section 4.6. The increase in the money supply brings about an increase in household wealth, a decrease in the labor supply, and an increase in demand for consumer goods. As a result there is excess demand in both markets. If prices and wages are not allowed to adjust (as a result of some prior decision of the central planners, say), the persistent excess demand will result in a movement from point $E$ to point $A$ similar
to that described above. To restore equilibrium and return to point E a contractionary government policy must be implemented: increase taxes which causes a decrease in wealth, \( \Omega \), an increase in the labor supply and a decrease in consumer goods demand, eventually causing a movement from point A to point E.

5.5 Inter-sectoral Effects of Excess Demand for A Goods

In section 5.1 we considered the effects of fixed, controlled prices for A goods and the resulting excess demands. In that case there is no automatic mechanism which would move the economy back into equilibrium. Then in sections 5.2-5.4 we considered the actions of households and enterprises under conditions of persistent, generalized excess demand utilizing the Barro-Grossman Non-Market Clearing Paradigm. In section 5.4 we saw that in general, the level of output and employment would be less than the market clearing levels. Also economic welfare could be increased, by allowing the nominal price level and wage rate to increase (even if the prevailing real wage is the equilibrium one). In doing so there is a wealth effect which increases the effective labor supply and hence output. As nominal prices rise to the equilibrium levels the level of output and employment rise to the equilibrium market clearing levels. An example which generates nominal wages and prices which are too low is a decrease in taxes (with
nominal prices and wages fixed) financed by an increase in the money supply. The increase in the money supply brings about an increase in wealth and excess demand in both markets. Then effective demands prevail which diverge from notional demands and a level of output and employment less than the equilibrium level is determined.

Now that we have illustrated the nature of effective demand functions and when they may arise, let us consider not the generalized excess demand case, but one of excess demand which persists in only one sector. Let us assume that from an initial equilibrium, similar to that of section 5.1, the system is disturbed by an exogenous increase in demand for A type consumer goods (and decrease in demand for money). Let us assume also that only the price of B type consumer goods is flexible and all other prices and wages are fixed, for simplicity. As a result the economy reaches a state, as in section 5.1, in which there is persistent excess demand for A consumer goods, both A and B capital services, and labor, in both sectors. Offsetting this will be an excess supply of money balances that both households and enterprises cannot spend. Again since prices, other than those for B consumer goods, and wages are fixed, no automatic mechanism exists to bring the system back into equilibrium. There is a divergence between the effective and notional demand for output and supply of labor. In Appendix F we derive the new consumer
good demand and labor supply functions. Let us consider each sector in turn.

Households are faced with excess demand for A goods. Assuming A and B consumer goods are not substitutes (or if they are, they are not perfect substitutes and households are no longer willing to substitute B goods for the unattainable A goods), the shortage of A consumer goods is a constraint on the utility maximization of households, and the greater the shortage the more binding the constraint. The resulting labor supply and money demand functions will be effective supply and demand functions similar to those derived in section 5.2. Here we assume that the shortage of A consumer goods affects the supply of labor to A enterprises and to B enterprises equally. Further, we assume that the aggregate wage and the wage in each sector \( w_A \) and \( w_B \) are set by the central planners and do not change. The resulting labor supply functions may be written from Appendix F as:

\[
\begin{align*}
\ell^S_A &= \ell^S_A (\bar{w}_A, \bar{w}_B, \bar{p}_B, \bar{\Omega}, \bar{g}_p, C_A) \\
&+ - - - + + \\
\ell^S_B &= \ell^S_B (\bar{w}_A, \bar{w}_B, \bar{p}_B, \bar{\Omega}, \bar{g}_p, C_A) \\
&- + - - +
\end{align*}
\]

In general these functions will have the same form in constrained and unconstrained periods but the actual amount
will differ during these periods \(0 \leq t \leq \hat{N}, \hat{N} < t \leq N',\)
\(N' < t \leq N\) as outlined in section 5.2 above.

It is clear that as the amount of A-type consumer goods increases the effective supply of labor, \(L_s^s',\)
increases (equations (139), (140)). Thus for any given vector of wages, prices and control parameters, the
greater \(c_A\) (or the less binding the constraint on A-type consumer goods) the greater \(L_s^s'.\) Since the effective supply of labor is a constraint on enterprises (as we see below) this has particularly important implications for the MCPE's strategy for economic reform (eliminating central planning and price controls on certain types of goods) as a means of attaining higher levels of growth. (We examine this more closely when we specify the enterprise sector.)

Households also take into account the constraint on A consumer goods when determining their demand for A and B consumer goods. The result is an effective demand for B consumer goods which differs from the notional in that \(c_A\) is an argument in the effective demand for B-type consumer goods in both the constrained period and future unconstrained period. We have:

\[
(141) \quad c_{B}^{d'} = c_{B}^{d'}(P_A, P_B, \bar{w}_A, \bar{w}_B, \Omega, \varrho, c_A)
\]

\[- - + + - \pm \pm \]

The sign of \(c_{B}^{d'}\) with respect to \(c_A\), as mentioned in Appendix F depends on whether A- and B-type goods are substitutes or
complements. We would expect that A- and B-type goods are to some degree substitutes and therefore the sign would be negative. However, one must not rule out the possibility that the goods are complements or simply unrelated in consumption. Again, this effective demand prevails during the constrained and unconstrained period but a different (lower) level of B consumer goods demand will be determined after the constraint on A goods is removed.

In the A goods sector the actual level of consumption of A goods is determined by the supply during the constrained period \(0 \leq t \leq \hat{N}\). During the unconstrained period \(\hat{N} < t \leq N\) there will be an effective demand for A-type consumer goods of the form:

\[
(142) \quad c_A^d = c_A^d(F_A, P_B, \bar{w}_A, \bar{w}_B, \Omega, g_B, c_A)
\]

In addition there will be an effective demand for money balances similar to that of section 5.2:

\[
(143) \quad m^d = m^d(F_A, P_B, \bar{w}_A, \bar{w}_B, \Omega, g_B)
\]

Combining the supply and demand for labor graphically we have the level of employment determined by the prevailing real wage in each sector (where \(P\) is a weighted average of \(P_A\) and \(P_B\)) and the effective supply of labor in each sector \(l_A^S\), \(l_B^S\) as illustrated in Figures 12 and 13.

(Note that \(l_A^S(\Omega)\big|_{c_A} l_B^S(\Omega)\big|_{c_A}\) and point A in Figures 12,
13 are analogous to \( \kappa^S(\Omega_2) \) and point A in Figure 9.)

![Diagram of the labor market]

**Figure 13. The Labor Market: A Goods Sector**

We see that, as in Section 5.2, even if the real wage in each sector is the equilibrium real wage, \((\frac{w_A}{F})^*, (\frac{w_B}{F})^*\) the nominal wages and prices are too low, (and the level of real wealth too high) so that with the constraint on A consumer goods there is excess demand for labor. At
real wages \( \left( \frac{w_A}{p} \right)^*, \left( \frac{w_B}{p} \right)^* \), there is excess and demand for labor of:

\[ E^d = (l^*_A + l^*_B) - (l^-_A + l^-_B). \]

---

**Figure 14. The Labor Market: B Goods Sector**

Further if we compare two levels of A-type consumer good availability we see that for every given real wage the effective supply of labor will be less when \( c_A < c_A^1 \)
prevails. For example if the level of \( A \)-type consumer goods available to households is \( c_A \) then \( \lambda^S_A(\bar{\omega}_2)|_{c_A} \), and

\( \lambda^S_B(\bar{\omega}_2)|_{c_A} \) are the prevailing labor supply curves. At real wage \( \left( \frac{W_A}{P} \right)^* \) and \( \left( \frac{W_B}{P} \right)^* \) there is excess demand for labor of:

\[
\Sigma^d = \left( \lambda^*_A + \lambda^*_B \right) - \left( \lambda^*_A + \lambda^*_B \right) > \left( \lambda^*_A + \lambda^*_B \right) - \left( \lambda^*_A + \lambda^*_B \right).
\]

If this is the case then the constraint on the availability of labor that enterprises face is tighter now than in the initial case with \( c^1_A \) of \( A \)-type consumer goods available. If the central planners can relax the constraint on the available consumer goods, and thus on the labor supply, output will increase (as we see below).

One method that central planners may choose is simply to let the price of some or all \( A \) goods fluctuate, that is, make some \( A \) goods \( B \) goods. If this takes place (a CPE suddenly becomes a MCP or a MCP relaxes price controls on a larger number of \( A \) goods) then the level of excess (aggregate) demand for \( A \) goods (still constrained) will fall. That is, the constraint on \( c_A \) becomes less binding in the aggregate as the supply of \( A \)-type consumer goods, whose controlled prices are now relaxed, increases. \( c^1_A \) now is the relevant constraint rather than \( c_A \) and the effective supply of labor increases from \( \lambda^S_A(\bar{\omega}_2)|_{c_A} \) to
$\lambda^S_A(\Omega_2)|_{c_A^1}$ and from $\lambda^S_B(\Omega_2)|_{c_A^1}$ to $\lambda^S_B(\Omega_2)|_{c_A^1}$. The constraint on enterprises, the excess demand for labor, then decreases as well, from

$$E^d_\lambda = (\lambda^*_A + \lambda^*_B) - (\lambda^1_A + \lambda^1_B)$$

at any given real wage. (This occurs even as the real wage falls due to the increase in $P_A$.) In general, the more A-type goods in the economy the greater the potential divergence between the effective labor supply and the notional labor supply. (We shall continue to compare the CPE or MCPE with a large number of A-type consumer goods with that of the MCPE with fewer A-type goods, e.g. comparing $\lambda^S(\Omega_2)|_{c_A^1}$ with $\lambda^S(\Omega_2)|_{c_A^1}$.)

We must also note that central planners may attempt to alleviate the excess demand in strategic sectors, such as A capital services, by adjusting wages and prices, or adjusting planning parameters such as $\alpha$ and $g_s$ in those sectors only. However, we assume for simplicity that the labor shortage is evenly distributed across all sectors.

Enterprises now, as in previous chapters, maximize a combination of value added and profits ($L_t = (1-\alpha)P_t + \alpha VA_t$) subject to the constraints outlined in section 5.3 and the constraint on labor resulting from the excess demand for labor. The supply of output in both A and B goods sectors
(the supply of A- and B-type consumer goods and A- and B-type capital services) is constrained by the shortage of labor. Since the shortage of consumer goods generates the labor force disincentives, let us assume that the prices of capital services adjust (via market pressure or by action of central planners) and those markets clear. (If these prices do not adjust, enterprises will maximize their objective function constrained by the available capital services as well as the available labor supply as noted in section 5.3 and Figure 10).

The effective supply of output functions which result may be written as:

\[
(144) \quad y_A^s' = y_A^s(\bar{p}_A, \bar{p}_B, r_A, r_B, \bar{g}_S, \alpha, \bar{\ell}_A) \\
+ - - - + \geq 0 + 
\]

\[
(145) \quad y_B^s' = y_B^s(\bar{p}_A, \bar{p}_B, r_A, r_B, \bar{g}_S, \alpha, \bar{\ell}_B) \\
- + - - + \geq 0 + 
\]

In maximizing a combination of value added and profits, enterprises demand capital services and combine them with the available labor to produce the level of output

\[ y_A^s, y_B^s \], which maximizes \( \ell_t \) given the prevailing prices, planner's control variables and available labor supply. The effective demand for capital services and enterprise deposits may be written as:

\[
(146) \quad k_A^{d'} = k_A^{d'}(\bar{p}_A, \bar{p}_B, r_A, r_B, \bar{g}_S, \alpha, \bar{\ell}_A) \\
+ + - \pm + + - 
\]
(147) \[ k^d_B = k^d_B \left( F_A, P_B, r_A, r_B, e_s, \alpha, \lambda_B \right) \]

and

(148) \[ e^d_A = e^d_A \left( F_A, P_B, r_A, r_B, e_s, \alpha, \lambda_A \right) \]

(149) \[ e^d_B = e^d_B \left( F_A, P_B, r_A, r_B, e_s, \alpha, \lambda_B \right) \]

Figures 15 and 16 depict the markets for consumer goods. (Note again that \( c^s_B \big| \lambda_B \), \( c^s_A \big| \lambda_A \) and point A in Figures 15 and 16 are analogous to \( y^s \) and point A in Figure 14.) In both the A and B goods sector \( P_A \) is fixed and a shortage develops. The shortage induces workers to withdraw from the labor force to the extent that (1) their income cannot be spent on desired A-type consumer goods, and (2) B-type consumer goods are no longer reasonable substitutes for the A-goods. As a result, unwanted money balances accumulate and workers choose leisure over employment. The decreased availability of labor is assumed to affect both sectors equally and enterprises are forced to maximize value added and profits with the additional constraint of a limited amount of labor. This generates effective supplies of both A and B consumer goods \( c^s_A \big| \lambda_A \), \( c^s_B \big| \lambda_B \) respectively. Since the price of B-type consumer
goods is flexible, however, the market for B-goods will clear at a real wage less than \( \frac{w}{F_B} \), but the shortage of A-type goods will persist: \( E_{c_A}^d = (c_A^* - c_A) \). Note though that even though the market for B-type consumer goods may clear the level of goods purchased will be less than \( c_B^* \).

![Diagram]

Figure 15. The Consumer Goods Market: A Goods

Note that the degree to which households are constrained on A-type goods markets is important. Again let us briefly compare the CPE (or MCPE with a large number of A-type
goods) and the MCPE with fewer controlled A-type goods.

If we assume that the economy with the greater number of controlled goods (the CPE) has also the greater level of excess demand then we can make a simple comparison between the levels of output and employment between the CPE and MCPE. Let us assume that $c_A$ and $c_{A}^{l}(c_A < c_{A}^{l})$ are the levels of A-type goods available to the households in the CPE and MCPE respectively. This generates different effective labor supply functions as described above

\[
(\ell_A^{S'}, \ell_B^{S'}) \quad \text{versus} \quad \ell_A^{S'} \quad \text{versus} \quad \ell_B^{S'}
\]

and a different
level of employment: $\ell_A' + \ell_B'$ versus $\ell_A' + \ell_B'$ in Figures 12 and 14 respectively, at real wage $(\bar{W})^*$. 

In the CPE case the available supply of labor will then be less (all other things equal) due to the more restrictive constraint on A-type consumer goods. This results then in an effective supply of A- and B-type consumer goods which is less, at a given real wage, than the effective supply for the MCPE. These are depicted in Figures 15 and 16 as $c_A^S' \bigg|_{\ell_A'} < c_A^S \bigg|_{\ell_A^1}$ and $c_B^S' \bigg|_{\ell_B'} < c_B^S \bigg|_{\ell_B^1}$ respectively. The level of excess demand which results will be greater for the CPE, with larger numbers of A-type goods and price controls (i.e., $c_A^* - c_A$) than the level of excess demand in the MCPE, with greater price flexibility and fewer A-type goods (i.e., $c_A^# - c_A^1$).

Figure 17 depicts the aggregate output, similar to Figure 11, and point A in Figure 17 is analogous to point A in Figure 11. The resulting level of aggregate excess demand for the MCPE is: $(y_2 - y_1)$. Again we see that a market clearing real wage may lead to excess demand if the nominal prices are rigid and at least one of them, $P_A$, is such that there is excess demand in one market, A consumer goods, which "spills over" into the labor market. The spillover into the labor market then inhibits the supply of other goods and generates aggregate excess demand. (Even if other prices adjust so that there is equilibrium
in all other goods markets, the rigidity in the price of A goods and wages leads to the persistent excess demand in the A consumer goods sector and therefore excess demand in the aggregate).

We can see that for the CPE (or MCPE with many A-type goods) the level of aggregate excess demand will be greater than \((y_2 - y_1)\). In this case \(y^S = \frac{k_A + k_B}{y^S} = c_A^{S^*} + c_B^{S^*} + k_A^{S^*} + k_B^{S^*}\) is the effective supply
curve to be considered and \( y^d \mid \lambda_A + \lambda_B = \)
\[ c_A^d + c_B^d + k_A^d \mid \lambda_A + \lambda_B \mid \lambda_A + \lambda_B \]

is the effective demand curve to be considered. The level of excess demand in the goods markets at real wage \((\frac{w}{P})^*\) will be \((Y_3 - Y) > (Y_2 - Y_1)\).

Now the entire model under conditions of excess demand in the A consumer goods market may be summarized as:

(150) \( \lambda = \lambda_A^s + \lambda_B^s < \lambda^s \)

(151) \( y = y_A^s + y_B^s = c_A^s + k_A^s + c_B^s + k_B^s \)

(152) \( c_A = c_A^d < c_A^s \)

(153) \( c_B = c_B^s = c_B^d > c_B^s \)

(154) \( k = k_A^d + k_B^d \)

(155) \( g^d = g^d \)

(156) \( y^d = c_A^d + c_B^d + k^d + g^d > y^d \)

(157) \( m = m^d > m^d \)

(158) \( e^d = e_A^d + e_B^d \)

(159) \( g^d + g_s = T + e^s \)

To determine the level of output and employment we proceed as in section 5.4. Figure 18 below is drawn assuming the existing real wage is \((\frac{w}{P})^*\) where \(w\) and \(p\) are
appropriate weighted averages of $w_A$, $w_B$, and $p_A$, $p_B$.

We assume that the weights do not change during the entire period under consideration. At this real wage the notional demand for labor is $\lambda^d_A((\frac{w}{p})^*) + \lambda^d_B((\frac{w}{p})^*)$ and the market clearing level of employment is $\ell^*$. The locus labeled $c^d_A + c^d_B + k^d_A + k^d_B + g^d$ is the notional demand for goods and $y^*$ is the general market clearing level of output prevailing at $(\frac{w}{p})^*$. Point E then, as in Figure 12 will be the general market equilibrium for the real wage $(\frac{w}{p})^*$

(and the given values of $g^d$, $\varepsilon$, $\alpha$, $M$, $b$, $T$, $a$, $N$, $N'$ and $\check{N}$). This point also corresponds to point E in Figures 13-17.

Now if the price of A goods and the wage rate (the weighted sum of $w_A$ and $w_B$) are such that $w = w_2 < w^*$, $p_A = p_{A2} < p_A^*$, $p_B = p_{B2} > p_B^*$, $p = p_2 < p^*$ (since the A goods market does not clear and the B goods market may) but $\frac{w_2}{p_2} = (\frac{w}{p})^*$, then the locus $c^d (\Omega_2, w, p_A, p_B \ldots) + k^d + g^d$ will be the new notional demand due to the higher level of household wealth ($\Omega_2 > \Omega^*$ since $p_2 < p^*$). As a result of the higher level of wealth, (the accumulation of undesired money balances) there is a decrease in the supply of labor. With no further adjustments in prices and wages, there will be excess demand in the labor market and in the consumer goods markets. There will be an
effective supply of labor, \( k^{S'} = k^{S'}_A + k^{S'}_B \) from Figures 13 and 14 and an effective supply of output \( y^{S'} = c^{S'}_A + c^{S'}_B + k^{S'}_A + k^{S'}_B \) from Figure 17. The determination of the level of output and employment is identical to the earlier case of generalized excess demand in Figure 12, but in this case the entire amount of excess demand for goods is on the A goods market and the excess demand for labor is equally divided between A goods and B goods. Again point \( A^* \) determines the equilibrium level of aggregate output and employment, with the difference between \( y^* \) and \( y^1 \) and \( k^* \) and \( k^1 \) measuring the difference between the actual levels of output and employment and the levels possible under general market clearing conditions for the MCPE.

The primary difference between \( k^{S'}(\Omega_2)\big|_{c \equiv 1} \) drawn for the CPE (or MCPE with a large number of A-type goods) and \( k^{S'}(\Omega_2)\big|_{c \equiv 1} \) drawn for the MCPE (with fewer A-type goods) is that (1) the constraint in the A-goods market is greater for the CPE, in the sense that the level of A-type goods available for consumption is less, and (2) nominal prices, \( p_2 \) and \( w \) are lower (fixed below the market clearing prices). Point \( A \) and point \( A^* \) and the resulting levels of output and employment (\( y \) and \( k \) versus \( y^1 \) and \( k^1 \)) are directly comparable as long as these differences are remembered. The movement
from point A to point A' is brought about by the increase in the price of A goods and the relaxation of the constraint on purchases of A-type consumption goods by households. (Note that if the real wage is not constant the curve will still shift to the right. The falling real wage will tend to reduce the effective supply of labor but the decrease in wealth and increase in availability of consumer goods tends to increase it. We will assume that the latter two effects outweigh the first so the effective labor supply shifts to the right. If the real wage remains constant the curve shifts to the right without question.)

To move from point A or A' to point E, the full employment level of output, the central planners have several options as in section 5.4. The first is to increase p_A and w proportionately so that \( \frac{w}{p}^* \) is maintained but the increase in p_A (the weighted increase in p_A is greater than the weighted decrease in p_B) decreases \( \Omega \) and increases the supply of labor \( \ell^S' \). As \( \ell^S' \) increases the \( \ell^S' \) curve shifts to the right, employment and output increase and point A gradually shifts to point E.

The second option is to increase taxes or decrease bonuses (both considered an exogenous component of \( \Omega \) here, as in Chapter 4 and earlier sections of this chapter, for simplicity). If taxes are increased, or bonuses decreased, for all workers (in both A and B sectors) equally there will
be a decrease in $\alpha$ and a movement from A to E analogous to that described above.

The third option is to directly influence the output mix by changing $\alpha$, the weight of value added in the enterprise objective function. The planners may decrease $\alpha_B$ in order to induce enterprises to produce more A-type consumer goods by shifting labor from the B goods sector to the A goods sector. Since the constraint on output in both sectors is the available supply of labor, this will have an impact only if the decrease in $\alpha_B$ is large enough so that B enterprises actually release labor to the A-goods sector. (Note that an increase in $\alpha_A$ will increase the demand for labor by A-type enterprises but it does nothing to alleviate the supply constraint.) B-enterprises release labor as $\alpha_B$ falls in an attempt to become more profitable in the eyes of the planners who evaluate the fulfillment of the assigned objective function. The labor released from the B sector will then be hired in the A sector and A goods output will increase. The level of B-goods output may fall when $\alpha_B$ decreases and employment in the B sector falls, but B goods prices are flexible and this market clears. As A goods output increases, still with fixed prices, the shortage of A-type consumer goods decreases and more labor enters both the A and B goods sectors. We move then from point A to point E as a result of two processes. First, the decrease in $\alpha_B$ increases the amount of labor
employed in the A goods sector and decreases the level of employment in the B goods sector (with no change in the overall level of employment). Then as the production and supply of A-type consumer goods increases the effective supply curve $L^S$ (.....) shifts to the right in Figure 18 and there is a multiplier effect. Output in both A and B sectors then increases as the supply of labor to both sectors increases. If the central planners change the value of $\alpha_B$ in the correct proportion we can move from A or $A'$ to E.

Figure 18. Determination of Output and Employment
It is not clear that the movement from point A, or \( A' \), to point E, brought about by either changing prices, taxes, or \( \alpha \), is necessarily desired by the central planners. It does increase the level of employment from \( i \) to \( i^* \) and the level of output from \( y \) to \( y^* \). However, there are changes in sectoral employment levels and the wealth accruing to workers in each sector which the central planners may not desire. Further, planners may find it difficult to adjust taxes, \( \alpha \), and other control parameters to move from A, or \( A' \), to E and find they must also change prices and wages. As a result there may be even greater reluctance to move toward the market clearing levels of output and employment since "the price-setting organs in Poland consider equilibrium less important than long-term price stability. It [stability] is favored not only by planning authorities, but also by consumers with fixed and low incomes."(13) In the case in which prices of A-type consumer goods are increased and these goods are basic necessities there will be an implicit change in the distribution of income which is detrimental to these lower income groups.

5.6 Summary

In this chapter we have extended the model developed in Chapter 4 to allow for excess demand in the goods markets and the labor market. In section 5.1 we disaggregated the model to explicitly treat A- and B-type goods and showed
that with prices fixed on A goods there was the potential for persistent excess demand for these goods. Sections 5.2 and 5.3 examine the behavior of households under conditions of excess demand for commodities, and enterprises under conditions of excess demand for labor, respectively. The divergence between the notional and effective supply and demand functions is emphasized under conditions of generalized excess demand. Section 5.4 reveals that under conditions of fixed nominal prices and wages the level of output and employment which results will be less than the full employment level of output when wages and prices are flexible and markets clear. This suggests that we should define domestic equilibrium or internal balance as the unconstrained level of employment and output (i.e. the full employment level when wages and prices are flexible and all markets clear). The economy then may be at a state of "effective equilibrium" at point A in Figure 12 but this will not be considered a true domestic equilibrium or internal balance, but a constrained equilibrium.

Section 5.5 considers the case of the MCPE in which some prices are flexible, the price of B goods, and some prices are fixed, the price of A goods. Here, as the number of goods with flexible prices increases, the economy moves from one constrained equilibrium to another, increasing the level of output and employment. The economy does not
move to point $E$, the point of internal balance, unless nominal wages and prices increase, the real wage is maintained at $(\frac{W}{P})^*$ and the level of wealth decreases to $\Omega^*$ from $\Omega_2^*$. This will occur when all $A$ goods are transformed to $B$ goods and markets are allowed to function perfectly or if central planners can continuously adjust the controlled prices to eliminate any excess demand.

Again it is not clear that the central planners desire the increased levels of output and employment, because associated with these gains would be changes in prices and wages, changes in the level of wealth and changes in the distribution of income. It may be that they are willing to sacrifice higher levels of output and employment for overall price stability and some given pattern of income distribution. This topic should be pursued in future research. In the next chapter we open up the hypothetical modified centrally planned economy and consider the implications of trade first without trade controls and then with trade controls. In each case a foreign disturbance is considered and when trade controls are imposed (central planners may use them in an attempt to alleviate the potential impact upon the domestic economy) the same types of disequilibrium outlined in this chapter are generated.
Notes to Chapter 5

(1) Grossman [90], p. 65. See also Barro [12] and Howitt [110] for further discussions of the problems of the NMC paradigm when applied to market type economies.

(2) Barro and Grossman [16] provide a detailed analysis and a brief critique of the re-contracting paradigm for the market type economy: Chapter 2.

(3) Barro and Grossman [16] also consider the case of general excess supply in the market type economy.

(4) Barro and Grossman [16] also consider the cases when \( \hat{N} > N^* \) and when \( \hat{N} \geq N \). There is no significant difference in these problems.

(5) See Barro and Grossman [16].

(6) Note that if we consider bonuses and taxes as exogenous as in section 4.5 then \( \Omega \) becomes nonwage wealth:

\[ \Omega = \frac{M(0)}{P} + b - T. \]

(7) In general \( \xi^s \) is constant but at different levels for \( 0 \leq t \leq \hat{N} \), and \( \hat{N} < t \leq N \). Similarly \( c^d \) is constant but at different levels for \( \hat{N} \leq t \leq N^* \), and \( N^* < t \leq N \). See Barro and Grossman [16], p. 73.
(8) See Barro and Grossman [16].

(9) Barro and Grossman [16] also consider the case when \( \hat{N} > N^* \) and \( \hat{N} \geq N \). In the case where \( \hat{N} > N \) the constraint is permanent and the household works only enough to pay for its available lifetime consumption, \( c \), and \( \frac{\partial l^S}{\partial w/p} = -1 \).

(10) See McCafferty [137].


(12) Technically, \( N, \hat{N} \) and \( N^* \) enter equation (114) and \( \hat{N} \) in the multiplier as well, since in equation (111) every term should be considered over its relevant time period. The multiplier gets larger, the larger \( \hat{N} \).

(13) Czerwinski [48], p. 380, his emphasis.
Chapter 6: The Open Modified Centrally Planned Economy

6.0 Introduction

In this chapter we shall consider the hypothetical modified centrally planned economy which now engages in trade. Its trade partner is "the rest of the world." We assume that the MCPE is a "small" country which can buy as many importables and sell as many exportables on world markets as it desires at given world market prices. We also ignore the distinction between East-West trade and intra-CMEA trade. This is obviously an over-simplification but the ultimate goal is to examine the impact of changes in world price upon the domestic economy, which historically has been manifested primarily through East-West trade. We initially consider the economy under equilibrium conditions in which prices for all goods are adjusting either via market pressures or central planners' perfect knowledge of scarcity prices. We shall also consider both A and B goods as well, and thus imports and exports are classified accordingly.

In addition to the basic characteristics of A goods described in Chapter 4, all foreign transactions involving A goods are conducted by Foreign Trade Organizations (FTOs, described below in section 6.3). Price-equalization
taxes and subsidies are applicable to A goods and as a result of these taxes (subsidies) and because of the fact that all A goods trade must be conducted by way of the FTOs, the government and central planners are able to maintain a fixed price for A goods on the domestic market. One of the fundamental differences between the classical centrally planned economy and the modified centrally planned economy is the influence of market forces which central planners allow in some markets, namely the market for B goods. An important aspect is the elimination of price equalization taxes and subsidies for these goods in foreign trade. That is, world market prices have a direct impact upon the domestic prices of B goods. B goods may be bought or sold by enterprises directly on world markets without the intermediate transaction with the FTO or they may be purchased through the FTO on a commission basis. ¹ We shall assume though, for simplicity, that all foreign trade takes place through the FTO.

Foreign Trade Organizations then conduct all international transactions involving all A goods for enterprises and households, the import of B consumer goods for households and the import or export of B capital services on a commission basis for enterprises. We also assume for simplicity that there is only one FTO which conducts all trade for enterprises and households, and that the FTO
is a passive actor in the economy simply fulfilling the export supply and import demand of the other actors, abstracting from sales commissions, etc. We shall later consider the case in which the state imposes trade controls on A goods (in section 6.5). The FTO plays a more active role in that case since part of its function is to control the flow of A goods according to the central planners' restrictions. We now have five entities within the MCPE which we must consider: (1) enterprises producing A goods, (2) enterprises producing B goods, (3) households, (4) the foreign trade organization, and (5) the state, or government sector (which includes the central planners and the central bank). We take all world market prices as exogenous to our MCPE model.

The demand for imports and the supply of exports by each sector is considered in the sections below. Section 6.1 discusses both the enterprise and household sectors. Section 6.2 discusses the FTO and definitional aspects of the balance of payments while section 6.3 reiterates these in a discussion focused in terms of monetary flows. The examination of several external disturbances are considered in section 6.4 and a graphical presentation of the internal balance-external balance trade-off is considered in section 6.5. The implications of trade controls on A goods and the resulting disequilibrium in the domestic economy are
also considered in section 6.5. Section 6.6 offers a summary of the results of this chapter.

6.1 Foreign Trade Activity of Enterprises and Households

The enterprise and household sectors in the open economy model are identical to those of the closed economy model with one major exception: a portion of the demand for capital services by enterprises and consumer goods by households may be met by foreign sources and a portion of the supply of output of enterprises may be sold abroad. Let us briefly consider the differences in behavior which arise as a result of the opportunity for foreign trade, first for enterprises then for households.

The enterprise sector is of course divided into enterprises producing A goods and enterprises producing B goods. Now some of the output may be produced for export, the actual level of export of A and B goods being determined by domestic suppliers since we have assumed the MCPE to be a small country which can sell as much as it desires at world market prices. Later we shall consider the case in which exports or some portion of exports are determined exogenously (see Appendix G). We assume that enterprises are indifferent between sales to domestic enterprises and sales to the FTO. In both the A goods sector and the B goods sector the domestic prices and the control parameters
are the same regardless of the buyer (as a result of price
equalization taxes and subsidies for A goods, and the small
country assumption for B goods). Enterprises then produce
a given supply of both A and B goods, some of which is
purchased domestically, the remainder purchased by the FTO
for export. They use labor and both A and B inputs, some
of which may now be imported. We also assume that enter-
prises are indifferent between purchasing these inputs on
foreign or domestic markets. (We ignore possible quality
differences, etc..)

A and B imported inputs are purchased from the FTO
and the total amount of each is determined by the amount
of the input demand not satisfied by domestic producers.
To the extent that the input is produced only abroad then
the level of imports is equal to the total domestic demand.
The excess demand for A-type inputs is evaluated in terms
of the fixed domestic price, and the difference between the
domestic value and the foreign currency value converted to
domestic currency at a fixed, given exchange rate will be
offset by (absorbed by) price equalization subsidies
(taxes). In contrast, the excess demand for B-type inputs
which is filled by imports arises at the domestic currency
equivalent of the foreign currency price. That is, the
price of B goods is simply the world market price converted
to zlotys at the official exchange rate, $R.2$
A convenient method of illustrating the different domestic and foreign transactions which may take place is to examine the components of the enterprises' demand for enterprise deposits. Conceptually there are two components of the demand for deposits by enterprises: (1) the demand originating from transactions with domestic enterprises, and (2) the demand originating from transactions with the FTO. We can write the flow demand for deposits in each sector as:

\[
(160) \quad e_A^d = P_A c_A^S + r_A k_A^S - w^d_A - r_B k_B^d, A - r_A k_A^d, A + e_{S, A} - b_A
\]

\[
(161) \quad e_B^d = P_B c_B^S + r_B k_B^S - w^d_B - r_B k_B^d, B - r_A k_A^d, B + e_{S, B} - b_B
\]

where each symbol is as previously defined and the superscripts d, A, and d, B refer to demand by A enterprises and by B enterprises respectively. Equation (160) indicates that A enterprises produce and supply consumer goods which are sold for price \( P_A \) on domestic markets, or to the FTO for export. In addition they may produce capital services, intermediate inputs, which are sold for a price \( r_A \) on domestic markets, or to the FTO for export. These sales along with government subsidies, \( e_{S, A} \), are the enterprises' sources of revenue. The enterprise makes expenditures for labor in the amount \( w \cdot l_A^d \), plus bonuses \( b_A \). It also pays \( r_A \) for A-type capital services and \( r_B \) for B-type capital services whether purchased on domestic markets or
from the FTO. All of the A enterprise transactions which occur on domestic markets or with the FTO are conducted in domestic currency or enterprise deposits. The transactions with the FTO give rise to a demand for foreign exchange which shall be discussed further below. Equation (161) for B enterprises may be interpreted in a similar manner.

We see that the enterprise sector contributes substantially to potential foreign trade flows since A enterprises supply A-type consumer goods and capital services for export and B enterprises supply B-type consumer goods and capital services for export. The enterprise sector accounts for the entire supply of exports and the entire demand for imported A- and B-type capital services. The remaining components of the demand for imports are from the household sector. (We assume that $g^d$, the government's demand for goods and services is satisfied on domestic markets.)

Households, recall, demand both A- and B-type consumer goods, some of which may now be imported. We assume for simplicity that all imported goods which households demand are purchased from the FTO and that households do not export any goods. They sell only labor services on the domestic market. Further, we assume that households do not hold any foreign exchange, and there are no invisibles or direct remittances from abroad. 3 As a result we may write the household demand for money as:

\[(162) \quad m^d = w^d s + b - T - (p_A c_A^d + p_B c_B^d).\]
The household demands no foreign exchange, only domestic currency since all of its income \((w \cdot \xi^s + b - T)\), and all of its expenditures \((P_A c_A^d + P_B c_B^d)\) are in domestic currency. However, some of its transactions involve foreign trade and the last component of the domestic currency value of A-goods imports arises from the household sector, i.e., that part of \(c_A^d\) which can't be satisfied by domestic enterprises. Similarly, the last component of the domestic currency value of B-goods imports also arises from the household sector, that part of \(c_B^d\) which can't be satisfied by domestic enterprises.

6.2 The Foreign Trade Organization, the Balance of Payments and Price Equalization

Foreign trade organizations, sometimes called foreign trade associations, are the official state agencies which conduct all foreign trade activities for A-type goods. In the classical centrally planned economy they conduct all foreign trade and enable the state to maintain a complete separation of foreign and domestic prices. Although there are many FTOs and they usually deal with a specific commodity or commodity group we assume for simplicity that there is only one FTO which handles all A-type goods. Further we assume away all operating expenses which the FTO may have and all commissions it earns. We assume that the only profits which the FTO earns arise due
to the difference between the domestic currency prices and devisa valued prices for A goods. We assume that B goods are bought and sold at world market prices and the devisa value equals the domestic value. Recall that the devisa value is simply the world market price (indicated by an asterisk) times the official exchange rate, and we indicate this value by a "*'". e.g. $P_B^* = R P_B$. Since there are no price equalization taxes or subsidies on B goods, the domestic currency price will be equal to the devisa price as a result of international commodity arbitrage, i.e. $P_B = P_B^* = R P_B^*$. However, due to the separation of domestic and foreign prices by means of the FTO and price equalization taxes and subsidies, the world market price of A goods converted to domestic currency, the devisa price, will not in general be equal to the domestic price, i.e., $R P_A^* = P_A^* \neq P_A$. Thus, the FTO may earn profits or losses due to the difference between $P_A^*$ and $P_A$. Similarly it may earn profits or losses due to the difference between $r_A^*$ and $r_A$. Recall from Chapter 2, that these may be written in general as:

(163) $\Pi = V_{m_A}^* - V_{m_A}^* + V_{x_A}^* - V_{x_A}$,

where $V_{m_A}^*$ is the domestic currency value of A-type imports $(P_A^*(c_A^d + g_{c_A}^d - c_A^s) + r_A^* (k_A^d + g_{k_A}^d - k_A^s)$ for those cases in which there is excess demand on domestic markets), $V_{m_A}^*$ is the devisa value of those imports $(V_{m_A}^* = R V_{m_A}^*)$. 
and $V_{x_A}$ is the domestic currency value of $A$-type exports $x_A$

$$(P_A(c_A^d + g_{c_A}^d - c_A^s) + r_A(k_A^d + g_{k_A}^d - k_A^s))$$

for those cases in which there is excess supply on the domestic market, and $V_{x_A}$ is the devisa value of those exports.

Because of the limited or nonexistent capital markets in most CPEs or MCPEs we assume there are no capital flows between the MCPE and the rest of the world, other than those directly offsetting the flows of goods. Thus the balance of payments (trade) may be found by summing all of the components of export supply and import demand as outlined above. We may compute, then, balances in terms of domestic prices, foreign prices and the devisa value of foreign prices. To compute the domestic currency value of the balance of trade we simply evaluate all trade flows in terms of domestic prices. We assume that there are no trade controls so the domestic balance of payments may be written as:

$$(164) \quad B_A = P_A(c_A^s - c_A^d - g_{c_A}^d) + r_A(k_A^s - k_A^d - g_{k_A}^d)$$

or

$$(165) \quad B_A = V_{x_A} - V_{m_A}$$

$$(166) \quad B_B = P_B(c_B^s - c_B^d - g_{c_B}^d) + r_B(k_B^s - k_B^d - g_{k_B}^d)$$
or

\[(167) \quad B_B = V_{x_B} - V_{m_B},\]

for B-type goods. The total balance of trade is then

\[(168) \quad B = B_A + B_B.\]

The foreign currency values may be computed by evaluating the same trade flows in foreign currency units, and the devisa value of these balances is simply the foreign currency balance converted to domestic currency by means of the official exchange rate. These are not necessarily equal to the domestic currency balances of (165), (167), (168), because the devisa prices of A goods may not be equal to the domestic prices of A goods, i.e. as mentioned above

\[P_A^* R = P_A^* \neq P_A\]

and therefore \[B_A^* R = B_A^* \neq B_A.\]

However, the devisa prices of B goods do equal the domestic prices of B goods, since \[P_B^* R = P_B^* = P_B\]

and therefore \[B_B^* R = B_B^* = B_B.\]

The profits on price discrepancies may then be written as

(from Wolf [241], see Chapter 3):

\[(169) \quad \Pi = B_A^* - B_A\]

As a result, the difference between the devisa balance of payments and the domestic value of the balance of payments is simply the profits (or losses) resulting from price discrepancies (since \[B_B^* = B_B\]).

6.3 Monetary Aspects

We can also compare the flow demands and supplies of currency and deposits to arrive at the familiar Western
definition of the balance of payments via the monetary approach: the balance of payments is the difference between the flow demand and supply of money (household currency plus deposits in this case). Recall the household demand for money balances (domestic plus foreign denominated) evaluated in domestic currency was found to be:

\[(170) \quad m^d = w^s + b - T - (P_A C_A^d + P_B d_B)\]

From A enterprises the total (net) demand for monetary deposits was:

\[(171) \quad e^d_A = P_A C_A^s + r_A k^s_A - w^d_A - b_A - r_B k^d_B - r_A k^d_A + e_{S,A},\]

and for B enterprises we have:

\[(172) \quad e^d_B = P_B C_B^s + r_B k^s_B - w^d_B - b_B - r_B k^d_B - r_A k^d_A + e_{S,B}.\]

Since we have assumed that all foreign trade takes place through the FTO, the net demand for foreign exchange may be observed by examining the FTO's flow demand for money balances. We can compute this demand for money, household currency plus enterprise deposits, by summing the FTO's revenues and expenditures in either domestic or foreign currency. The FTO's domestic revenues are equal to the amount of expenditures on imported goods by enterprises and households. That is, domestic revenues are:

\[DR = P_A C_{A,FT}^d + P_B C_{B,FT}^d + r_A k_{A,FT}^d + r_B k_{B,FT}^d,\]

where FT denotes the amount of each good purchased by (or via) the FTO. The FTO's domestic expenditures are equal to
the amount it pays enterprises for goods to be exported by the FTO:

\[ DE = P_A^* c_A^{S,FT} + r_A^* k_A^{S,FT} + P_B^* c_B^{S,FT} + r_B^* k_B^{S,FT}. \]

Then the demand for domestic currency deposits before price equalization taxes or subsidies is the difference between the FTO's domestic revenues and expenditures:

\[ e^d_{FTO} = P_A^* E_{C_A}^d + c_A^d E_{k_A}^d + P_B^* E_{C_B}^d + r_B^* E_{k_B}^d, \]

where \( E_{C_A}^d = c_A^s - c_A^d \), and \( E_{C_A}^d = c_A^{d,FT} \) if \( c_A^s - c_A^d < 0 \) and \( E_{C_A}^d = c_A^{s,FT} \) if \( c_A^s - c_A^d > 0 \) (similarly for \( E_{C_B}^d, E_{k_A}^d, E_{k_B}^d \)).

\( e^d_{FTO} \) then, is the demand for enterprise deposits which results from the FTO's purchases and sales of A- and B-type goods on domestic markets.

The FTO's foreign revenues are equal to the foreign currency value of the exports which it sells abroad:

\[ FR = P_A^* c_A^{S,FT} + P_B^* c_B^{S,FT} + r_A^* k_A^{S,FT} + r_B^* k_B^{S,FT}. \]

The FTO's foreign expenditures are equal to the foreign currency value of the imports which it purchases for domestic users:

\[ FE = P_A^* c_A^{d,FT} + r_A^* k_A^{d,FT} + P_B^* c_B^{d,FT} + r_B^* k_B^{d,FT}. \]

The demand for foreign currency holdings before price equalization subsidies or taxes is:
(174) \[ f_{PTO}^d = P_A^*c_A^d + r_A^E k_A^d + P_B^*c_B^d + r_B^E k_B^d \]

where \( f_{PTO}^d \) is the demand for enterprise deposits which arise as a result of the FTO's transactions on world markets. The devisa value of these holdings is

(175) \[ f_{PTO}^d = R f_{PTO}^d \]

Thus we have two expressions which describe the demand for enterprise deposits by the FTO in domestic currency: the domestic currency value, (173), and the devisa value, (175), based on foreign currency prices converted at the official exchange rate. The difference between the two is profits (losses) on prices discrepancies:

(176) \[ \Pi = f_{PTO}^d - e_{PTO} \]

Note that since \( P_B = P_B^* R \), always (by assumption) all of the components of (176) dealing with B goods net out. The state then imposes a tax (subsidy) upon the FTO exactly equal to the profits (losses) on foreign trade transactions.\(^7\) This tax is:

(177) \[ A = \Pi = f_{PTO}^d - e_{PTO} \]

In effect, then, the state may be thought of as holding all of the FTO's deposits, always leaving the FTO with a balance of zero in its deposit accounts. These taxes (subsidies) may then be thought of as government revenues (expenditures) placed in (taken from) a distinct account
of the government at the central bank. (Recall in our model the central bank is assumed to be part of the government and central planners sector.)

Now let us define the total aggregate demand for money, \( m_a \) (household currency, domestically denominated enterprise deposits, and the devisa value of deposits arising from foreign transactions), as the sum of the household, enterprise, and FTO's demands. Thus we have:

\[
ma^d = m^d + e^d_A + e^d_B + (f^d_{FTO} - e^d_{FTO}),
\]

as the domestic currency value of all demands for money arising from domestic and foreign transactions of households and enterprises and the demands by the FTO.

Now recall that the flow supply of enterprise deposits in the closed economy (\( e^s \)) is the difference between government expenditures (\( g^d + g_s \)) and tax receipts (\( T \)). In the open economy model the government now also receives revenues, or pays out subsidies, as a result of price equalization (\( A \)). The flow supply of money is still the difference between domestic expenditures and revenues but now let us denote as \( f^s \), that component of the money supply which results from changes in price equalization subsidies (\( f^s = -A \)):

\[
e^s + f^s = g^d + g^s - T - A.
\]

Thus \( e^s + f^s \) is the flow supply of money in the open economy.

The excess demand for money (household currency and enterprise deposits) may now be written as:
\[(180) \quad m^d - (e^s + f^s) = (m^d + e^d_A + e^d_B) + (f^d_{\text{FTO}} - e^d_{\text{FTO}}) - (g^d + g^s - T - A).\]

If the flow supply of money created by the excess of expenditures by the government and central planners over domestic taxes is just equal to the flow demand for money for purchases of domestic goods, then the flow demand for purchases of goods above this level, i.e. purchases from abroad, will be equal to an excess demand for money balances by households and enterprises (net hoarding) met by foreign sources: the balance of payments. Thus, as in the market type economy the excess flow demand for money balances is equal to the balance of payments, in this case equal to the devisa balance. To show this substitute (160), (161), (162) and (177) into (180) to get

\[(181) \quad e^d_A + e^d_B + m^d + (f^d_{\text{FTO}} - e^d_{\text{FTO}}) - (e^s + f^s) =
\]

\[
[P_A(c^s_A - c^d_A - e^d_A) + P_B(c^s_B - c^d_B - e^d_B) +
\]

\[
r_A(k^s_A - k^d_A - e^d_A) + r_B(k^s_B - k^d_B - e^d_B) + w(l^s - l^d_A - l^d_B) + 2A]
\]

Assuming equilibrium in the labor market we arrive at the basic identity (derived by Wolf [241]):

\[(182) \quad (e^d_A + e^d_B + m^d) - (e^s + f^s) = B_A + B_B + A = B.\]

That is, net domestic hoarding by enterprises and households \((e^d_A + d^d_B + m^d)\) plus the government budget surplus
$(e^S + f^S)$ is equal to the devisa value of the balance of payments. 10

6.4 The Impact of Exogenous Disturbances with No Trade Controls

Sections 6.1 through 6.3, when combined with the closed economy model of Chapters 4 and 5, give us a complete model of the open MCPE. In this section several disturbances to the domestic economy will be considered with the use of this model. Before we consider the impact upon the domestic economy as well as the balance of trade, let us consider the definitions of internal and external balance. Recall that in section 5.6 we defined domestic equilibrium or internal balance as the unconstrained (i.e. when wages and prices are flexible) full employment level of employment and output (all markets clear). The economy then may be at either a notional equilibrium, which we consider internal balance (as indicated by point E in Figure 12), or an effective equilibrium, which is not considered a true domestic equilibrium or internal balance, but is considered a constrained equilibrium (as indicated by point A in Figure 12).

Similarly, we define external balance as a balance of trade deficit equal to zero when the supply and demand for exports and imports arise from the notional demand and supply functions. We may also have the case in which there are fixed prices (and trade controls; see section 6.5 below)
which generate effective supply and demand functions, an
effective internal balance, and an effective external
balance when the balance of trade (resulting from the effec-
tive supply and demand functions) is zero. Thus external
balance refers to a balance of trade deficit equal to zero
when the balance is determined by the notional supply and
demand functions of the domestic actors. With these distinc-
tions in mind, let us consider an exogenous disturbance, a
change in foreign or domestic prices for example, first in
the case in which there are no foreign trade controls,
then in section 6.5 when there are trade controls and
potential disequilibrium.

The impact of foreign currency price changes, i.e.
external inflation, was first analyzed by Wolf [241] (see
Chapter 3) for both the CPE and MCPE. In this paper an
analytical framework was developed which allowed the dif-
f erent responses of CPEs to be examined. He showed that
"price-equalization subsidies (taxes) per se are unlikely
to affect the domestic money supply or real variables such
as output or expenditures," 11 if real trade flows have not
changed and the authorities take appropriate actions to
finance the change in price equalization subsidies. These
aspects are pursued further by Wolf [241] and he shows that
under conditions of full employment the market type economy,
the traditional centrally planned economy, and the modified
centrally planned economy can all, in theory, completely
insulate themselves (that is, maintain internal equilibrium), from both real and monetary effects of external inflation, but suffer external disequilibrium in doing so. In a more complex four good model (Wolf [238]), these results are extended for a hypothetical MCPE and three policy strategies (wait and see, emulate the CPE, and emulate the HTE) are examined. The model we have developed here will allow us to examine the same type of disturbances in both an equilibrium and an explicitly disequilibrium framework. Further, we may examine the response of planners to such disturbances. That response may involve changes in controlled prices as well as control parameters such as \( \alpha \).

Let us now consider the impact of exogenous changes in foreign and domestic prices upon: (1) the balance of trade, (2) price equalization profits (losses) and taxes (subsidies), (3) the domestic money supply (household currency and enterprise deposits), and (4) aggregate output. The balance of trade, from equation (181), may be written in terms of excess demands as:

\[
(183) \quad E_{ma}^{d} + wE_{k}^{d} = -[P_{A}E_{cA}^{d} + P_{B}E_{cB}^{d} + r_{A}E_{rA}^{d} + r_{B}E_{rB}^{d}] + A
\]

similar to the expressions of Appendix E. If the excess demand for labor is zero then the excess flow demand for money balances, \( E_{ma}^{d} \) (which includes the flow supply resulting from a government budget deficit), is equal to the devisa value of the balance of trade \( (B + A) \), as derived in equation
(182). From this it can be seen that a change in prices (domestic prices, \( P_A, P_B, r_A, r_B \)), for any reason, has two potential channels of influence upon the balance of trade. The first is the direct (short run) change due to the change in value of a constant flow of real goods. The second is the change (longer run) in the flow of real goods (the enterprise, planners, and/or household response) which may result from the price changes.

To illustrate these two channels and the fact that only changes in domestic prices will evoke the second response (by enterprises, planners, and households), let us consider a change in the domestic currency price of \( A \)-type consumer goods, assuming for the moment an initial position of internal and external equilibrium, and that domestic authorities control these prices and for some reason desire this change. Differentiating equation (183), we have

\[
\frac{dE}{dP} = \left[ \frac{\partial E_{A}}{\partial P_{A}} \right] dP_{A} + \left[ \frac{\partial E_{B}}{\partial P_{A}} \right] dP_{A} = \frac{\partial E_{A}}{\partial P_{A}} dP_{A} + \frac{\partial E_{B}}{\partial P_{A}} dP_{A}.
\]

which can be written in terms of elasticities as:

(185) \( dB = P_{A}(c_{A}(\zeta_{P} + 1) - c_{A}(\epsilon_{P} + 1)) + P_{B}(c_{B}(\epsilon_{P}) - c_{B}(\epsilon_{P} + 1)) + r_{A}(k_{A}(\epsilon_{P}) + k_{A}(\epsilon_{P} + 1)) + r_{B}(k_{B}(\epsilon_{P}) + k_{B}(\epsilon_{P} + 1)) \]
This expression clearly shows that a change in the domestic price of A-type consumer goods has an impact upon every other commodity and the exact impact upon the domestic currency balance of trade depends upon the relevant supply and demand elasticities. The immediate short run effect (assuming these elasticities are zero) will be:

\[
(186) \quad dB = -\hat{p}_A^*(p_A^*(c_A^d - c_A^S))
\]

That is, we have simply a change in the value of A-type consumer goods and a constant flow of those (and other) goods, since there is, as of yet, no response to the price change itself by the agents in the domestic economy.

Note that for a change in the foreign currency price of A-type consumer goods we have a similar result with respect to the foreign currency balance of trade.

Since

\[
(187) \quad B^* = -[p_A^*E_{c_A}^d + p_B^*E_{c_B}^d + r_A^*E_{k_A}^d + r_B^*E_{k_B}^d]
\]

we have

\[
(188) \quad dB^* = -\hat{p}_A^*(p_A^*(c_A^d - c_A^S)).
\]

Here, all of the elasticities are zero since foreign currency prices do not affect the production and consumption decisions of enterprises or households. They respond to changes in domestic prices which in this case have not changed. The foreign currency price of B-goods has not changed, by assumption, and the change in the foreign
currency price of A-type goods is not permitted to influence
the domestic price of A goods, because of price equalization.

The foreign currency price change, for A-type
consumer goods, although it has no impact upon real trade
flows, does have an impact upon profits or losses due to
price discrepancies, \( \Pi \), the level of price equalization
taxes or subsidies, \( A \), and therefore the government budget
deficit.\(^{14}\) Continuing with the example of the foreign
currency price change, \( dP^*_A > 0 \) say, the change in profits
will be (from equation (169)):

\[
(189) \quad d\Pi = R dB^*_A + dR \cdot B^*_A - dB_A, \text{ and if the exchange}
\]
rate and domestic prices do not change we have:

\[
(190) \quad d\Pi = R dB^*_A = dB^*_A
\]

The change in profits due to price discrepancies clearly
depends upon the change in the devisa balance of trade
on A-type goods (consumer goods in this case) which in turn
depends on the initial balance (from equation (188)).

Since profits (losses) on price discrepancies have
changed, taxes (subsidies) from (to) the FTO will change as
well. The government surplus or deficit will be affected as
well. (The effects may be eliminated, as Wolf [\( \ldots \)] shows,
if the domestic authorities take the appropriate policy
actions.) Now, if we assume initially there is a hard
currency deficit on A goods trade and \( dP^*_A > 0 \), then
\( dB_A^* < 0 \) (from equation (188)) and \( d\Pi < 0 \) (from equation (190)). This would have been the case, for example, for the import of certain foodstuffs or intermediate inputs in the early 1970s (see Fallenbuechl [64]). From equation (179), of section 6.3, the government budget deficit (or surplus) is the flow supply of enterprise deposits:

\[
(191) \quad e^S + f^S = g^d + \varepsilon_S - T - A.
\]

Now as \( \Pi \) decreases \( A \) does as well and the government budget deficit (surplus) increases (decreases). There is no change in the supply of enterprise deposits available to the enterprises themselves, \( e^S \), unless government expenditures \( (g^d + \varepsilon_S) \) or taxes \( (T) \) change. Since, in this case, there has been no change in real trade flows, but only a change in the value of the flow (which is taxed away at the FTO), there is no change in the domestic money supply other than \( f^S \). The drawing down of deposits which results from the decrease in \( A \), \( f^S \), is one component of the fall in deposits to pay for net imports. Specifically \( f^S \) is the additional amount of foreign exchange necessary to pay for the more expensive but constant real flow of goods from abroad. The change in \( A \) and accompanying change in \( f^S \) has no further impact upon the domestic economy unless there is an explicit policy change by the government authorities. The now greater balance of trade deficit (greater by the amount \( f^S \)) can be maintained until foreign currency reserves are depleted (or the government authorities...
are no longer willing to reduce reserves), or the opportunity to borrow international reserves is exhausted.

If the authorities are obsessed with a balanced budget (in the past, evidence has suggested that balancing the government budget is an important policy target)\textsuperscript{15} and there are adequate foreign exchange reserves (to finance the external imbalance), one option the authorities may choose to balance the budget is to increase taxes, rather than decrease expenditures, change domestic prices, or change the exchange rate. (Note that changing the exchange rate may easily eliminate the price equalization subsidies (taxes) but it now has an impact on the domestic price level through B goods prices. Changes in the exchange rate now introduce further price distortions and therefore it may be less likely that the exchange rate is used as a policy tool in the MCPE. Thus if the authorities desire both price level stability and a balanced budget without decreasing expenditures then they must increase taxes.) If the government then increases taxes, $T$, in its attempt to balance the budget, the first impact is to decrease the flow demand for money balances, $m^d$, and the level of wealth, $\Omega$, as outlined for the closed economy in section 4.6. In the closed economy model, as household wealth decreases households demand less consumer goods and offer more labor services. This results in excess supply in both markets. Equilibrium is achieved only after both prices and
wages decrease equipropotionately (remaining at the equili-
brium real wage) increasing real wealth, and thus offsetting
the decrease in wealth caused by the increase in taxes.\textsuperscript{16}
Here, in the open economy case, the domestic excess supply
of $A$ consumer goods reduces the inflow of imported $A$ con-
sumer goods without affecting their price or the price of
$B$ consumer goods, since these prices are determined by the world
market. The excess supply of labor would force the wage
rate down but since there is no change in prices the level
of real wealth does not increase in the open economy as it
did in the closed economy model.

Since the level of wealth has fallen (due to the
increase in taxes) the demand for $A$ consumer goods falls
and the level of imports (the excess demand met by foreign
sources) falls even though there is no change in domestic
prices. The balance of payments (both foreign currency
and domestic) improves as a result and profits (losses)
on price discrepancies increase (decrease) (assuming, of
course, not all of the decrease in consumption due to the
decrease in wealth is $B$ consumer goods). The entire
economy may return to internal equilibrium (all domestic
markets clear, assuming full employment is maintained, and no
government budget deficit) and to the original balance of
trade position (we assumed an initial $A$-goods deficit,
above) only under certain conditions.
The exact size of the tax increase which balances the budget can be found by differentiating equation (191) (ignoring the effect of the potential change in the labor supply, wage rates and therefore the demand for capital services as explained below) and solving for $dT$:

$$
(192) \quad dT = \frac{-dA}{1 + [(P \frac{c^*_A}{A} - P \frac{c^*_R}{A}) \frac{\partial c^*_A}{\partial A} \frac{dA}{dT} + \frac{\partial A}{dT} - A - B - C - D - E - F - G - H - I - J - K - L - M - N - O - P - Q - R - S - T - U - V - W - X - Y - Z]}$$

Since we are considering the case in which $R < 0$, $P \frac{c^*_A}{A} < P \frac{c^*_R}{A}$, the denominator is greater than one (the bracketed term takes into account the increase (decrease) in profits (losses) on price equalization and therefore the decrease (increase) in subsidies (taxes) to (from) the FTO. That is, the increase in taxes causes a reduction in real wealth and therefore a decrease in demand for consumer goods. To the extent that some of these consumer goods are imported, a consumer goods there will be a decrease (increase) in price equalization subsidies (taxes). Thus there is a multiplier effect and the increase in taxes required to balance the budget will only be some fraction of the increase in price equalization subsidies.

Note that as a result of the change in taxes the balance of trade changes as well. The economy will return to the original balance of trade position if:
(193) \[ dB^* = -[P^*_A \frac{dc^d_A}{\partial \Omega} + P^*_B \frac{dc^d_B}{\partial \Omega}] \, dT, \]

where \( dB^* \) is the change in the foreign currency balance of trade due to the change in the foreign currency price of \( A \)-type consumer goods (also equal to the original \( dA \) and \( f^S \)) and the right hand side is the change in the balance of trade which occurs due to the change in wealth caused by the change in taxes. That is, if the resulting wealth effect generates a decrease in the imports of consumer goods exactly equal to the initial change in the foreign currency balance of trade, we will return to the original balance of trade position. Substituting for \( dB^* \) and solving for \( dT \) we have:

(194) \[ dT = \frac{\hat{P}^*_A (P^*_A (c^d_A - c^A))}{(P^*_A \frac{dc^d_A}{\partial \Omega} + P^*_B \frac{dc^d_B}{\partial \Omega})}, \]

as the change in taxes that returns the economy to the original external position.

This is not, however, the final impact of the change in taxes. The impact of the decrease in wealth upon the labor supply (as mentioned above) reinforces these primary effects. As the labor supply increases (due to the decrease in wealth) enterprises, to the extent possible, will substitute labor for capital services, some of which may be imported. The decrease in demand for capital services will,
given no trade controls and the small country assumptions, result in a decrease in imports (or an increase in exports) of capital goods. This also improves the balance of trade and, to the extent that some of these capital services are A goods, will increase profits due to price discrepancies by the FTO and reduce the level of subsidies and the government budget deficit.

There is no completely automatic mechanism which moves the open economy to equilibrium as in the closed economy equilibrium model because prices do not change. (Due to the small country assumptions, domestic prices for B goods are set on the world market. The domestic prices of A goods are set by the central planners. These may of course be continuously adjusted to correspond to world market prices but this does not occur automatically.) Furthermore, while changing taxes (or expenditures) is a useful policy tool for achieving either internal or external balance, equation (192) will only coincidentally be equal to equation (193) (indicating a return to both internal equilibrium and the initial balance of trade position), and it is unlikely that the domestic authorities would ever attempt to use one policy variable to attain both targets.

Before turning to a discussion of alternative policy variables and the internal-external balance trade-offs for the MCE, let us consider a more comprehensive example. The example above considered only a change in the price of
A-type consumer goods (\(dP_A > 0\)) when these goods are imported. Let us consider the MCPE which is importing \(c_A, c_B,\) and \(k_A\) and exporting \(k_B.\) This is closer to the actual situation for Poland in its hard currency trade during the early 1970s. Writing the foreign currency balance of trade in terms of excess demands we have

\[
B^* = -[P_A^* E_A^d c_A^d + P_B^* E_B^d c_B^d + r_A^* E_A^d k_A^d + r_B^* E_B^d k_B^d].
\]

Assuming government demand is constant and differentiating with respect to foreign trade prices, we have:

\[
(196) \quad dB^* = -dP_A^* E_A^d c_A^d + \frac{P_A^*}{R} \left( \frac{\partial c_A^d}{\partial P_B} - \frac{\partial c_A^s}{\partial P_B} \right) dP_B^* + \left( \frac{\partial c_A^s}{\partial r_B} \right) dr_B^*
\]

\[
- dr_A^* E_A^d k_A^d + \frac{r_A^*}{R} \left[ \frac{\partial k_A^s}{\partial P_B} - \frac{\partial k_A^d}{\partial P_B} \right] dP_B^* + \left( \frac{\partial k_A^d}{\partial r_B} - \frac{\partial k_A^s}{\partial r_B} \right) dr_B^*
\]

\[
- dP_B^* E_B^d c_B^d + \frac{P_B^*}{R} \left( \frac{\partial c_B^s}{\partial P_B} - \frac{\partial c_B^d}{\partial P_B} \right) dP_B^* + \left( \frac{\partial c_B^d}{\partial r_B} \right) dr_B^*
\]

\[
- dr_B^* E_B^d k_B^d + \frac{r_B^*}{R} \left[ \frac{\partial k_B^s}{\partial P_B} - \frac{\partial k_B^d}{\partial P_B} \right] dP_B^* + \left( \frac{\partial k_B^d}{\partial r_B} - \frac{\partial k_B^s}{\partial r_B} \right) dr_B^*.
\]

This expression, it must be emphasized, represents the change in the balance of trade which results from external price changes only. We are assuming that the central planners have not changed the basic plan, i.e., they have not changed the plan parameters \(\alpha, \xi,\) the level of government expenditures or taxes (and therefore no change
in the domestic money supply as a policy change) or the price of A-goods. Enterprises react only to the change in the domestic price of B-goods during the period under consideration. Now writing expression (196) in terms of elasticities we have:

\[
(197) \quad \text{dB}^* = -[dP_A^*e^d_A + dR^*k_A^d] + dP_B^*e^d_B + dR_B^*k_B^d
\]

\[
+ \frac{P_A^*}{R} [P_B^*(c_A^s - c_A^d) + R_B^*(c_A^s - c_A^d)] + \frac{R_A^*}{R} [P_B^*(k_A^s - k_A^d) - P_B^*(k_A^s - k_A^d)]
\]

\[
- k_A^d(k_A^s - k_A^d) + R_B^*(c_B^s - c_B^d)
\]

\[
+ \frac{R_B^*}{R} [P_B^*(k_B^s - k_B^d) - k_B^d]
\]

\[
+ \frac{R_B^*}{R} [P_B^*(k_B^s - k_B^d) - k_B^d]
\]

\[
+ \frac{R_B^*}{R} [P_B^*(k_B^s - k_B^d) - k_B^d]
\]

There are three distinct cases analogous to the Polish situation in the first half of the 1970s which may now be considered: (1) World inflation with no change in the terms of trade \((P_A^* = P_B^* = R_A^* = R_B^* = 0)\). This is roughly analogous to the Polish situation in 1975. (2) World inflation with an improvement in the terms of trade (in which we assume for simplicity that the prices of all imports increase at the same rate:

\[
+ \frac{R_B^*}{R} [P_B^*(k_B^s - k_B^d) - k_B^d]
\]
\( \hat{p}_A^* = \hat{p}_B^* = \hat{r}_A^* = \hat{r}_B^* = \Theta \), which corresponds to the Polish situation in 1971 and 1972. And (3), world inflation with a deterioration in the terms of trade (again assuming that the prices of all imports increase at the same rate: \( \hat{p}_A^* = \hat{p}_B^* = \hat{r}_A^* = \hat{r}_B^* = \Theta \)). This situation prevailed in 1973 and 1974. (18) Let us consider the details of each case in turn.

For the first case, in which there is no change in the terms of trade, we can write \( \hat{p}_A^* = \hat{p}_B^* = \hat{r}_A^* = \hat{r}_B^* = \Theta \), and

\[
\frac{d\gamma^*}{dB^*} = - \Theta [r_A^* E_A^d + p_A^* E_A^d + p_B^* E_B^d + r_B^* E_B^d] + \Theta [\frac{-\gamma_A^*}{P_A^*} + \frac{-\gamma_A^*}{P_B^*} + \frac{-\gamma_A^*}{P_B^*} + \frac{-\gamma_A^*}{P_B^*} + \frac{-\gamma_A^*}{P_B^*} + \frac{-\gamma_A^*}{P_B^*} + \frac{-\gamma_A^*}{P_B^*} + \frac{-\gamma_A^*}{P_B^*}]
\]

where the \( \gamma \)'s represent the weighted differences in elasticities, e.g.

\[
\gamma_A^* = \frac{c_A^*}{P_A^*} - \frac{c_A^*}{P_B^*}
\]

and may be thought of as a net import demand elasticity. The first term of (198) is the short run change in the balance of trade, the changed value of a constant real flow. The second term is the longer run effect, when the real flows change in response to the domestic price changes. That is, there is a relative price distortion introduced in the domestic economy since the
domestic price of B goods is allowed to change with changes in world market prices, but the domestic price of A goods remains fixed. We can see that the impact upon B* depends upon: (1) the initial balance of trade (the bracketed expression in the first term), (2) the exchange rate, and (3) the relevant own and cross price elasticities.

We would normally expect \( \varepsilon_{P_B}^A, \varepsilon_{P_B}^B, \varepsilon_{r_B}^A, \varepsilon_{r_B}^B, \varepsilon_{P_B}^C, \varepsilon_{P_B}^B, \)

\( \zeta_{P_B}^A, \zeta_{r_B}^B < 0, \) and \( \zeta_{P_B}^B, \zeta_{P_B}^B, \zeta_{r_B}^B, \zeta_{r_B}^B, \varepsilon_{P_B}^C, \varepsilon_{r_B}^B > 0, \)

which are the signs of the elasticities, as we have outlined in previous chapters. As a result we have:

\( \gamma_{P_B}^A, \gamma_{P_B}^B, \gamma_{r_B}^A, \gamma_{r_B}^B, \gamma_{P_B}^C, \gamma_{P_B}^B, \gamma_{r_B}^B < 0 \) and \( \gamma_{P_B}^C, \gamma_{r_B}^B > 0. \)

If the MCPE is initially running a balance of trade deficit and foreign currency prices increase, the first bracketed expression of (198) indicates the immediate short term impact will be a deterioration in the balance of trade.

When real trade flows respond to the change in the domestic price of B goods the second bracketed term indicates that A goods trade will deteriorate and B goods trade may either improve the balance or worsen it, if households, enterprises and planners indeed react as the above elasticities imply. First, with respect to A goods trade the increase in \( P_B \) indicates more A-type consumer goods will be demanded
(τ^C_A > 0) and fewer will be produced (ε^C_A < 0). Therefore
the increase in the level of excess demand will be met by
imports (τ^C_A < 0). Similarly the increase in \( r_B \) implies
a decrease in the supply of A-type consumer goods (ε^C_A < 0),
no change in the demand for A-type consumer goods
(τ^C_A = 0), and thus an increase in imports of c_A (τ^C_A < 0).

Imports of A-type consumer goods increase as a result of
the increase in \( P_B \) and \( r_B \) and the trade balance with respect
to A-type consumer goods deteriorates. The effects of the
increase in B goods prices upon \( k_A \) are similar. The increase
in \( P_B \) decreases the supply of A-type capital services (if
enterprises produce either consumer goods or capital
services then ε^P_A < 0) and increases the demand for A-type
capital services (τ^P_A > 0), thus increasing the excess
demand for A-type capital services which may be imported
(τ^P_A < 0). The increase in \( r_B \) causes a decrease in the
supply of A-type capital services (if B-type capital
services are used in the production of A-type capital
services, ε^r_A < 0) and an increase in demand for A-type
capital services (if A- and B-type capital services are
substitutes, \( r^*_r A > 0 \). As a result the excess demand for A-type capital services increases and this may be met by imports (\( r^*_r A < 0 \)). The net result is that there is an increase in the level of imports of A-type goods

\[ (p^*_A (\frac{c^*_A}{r^*_r A} + \frac{c^*_B}{r^*_r B}) + r^*_A (\frac{k^*_A}{p^*_B} + \frac{k^*_B}{r^*_r B}) < 0). \]

With respect to B-goods trade the impact of the price changes are less clear. Similar arguments to those above may be made for each of the individual elasticities and we find that \( \frac{c^*_B}{p^*_B}, \frac{k^*_B}{r^*_r B} > 0 \) and \( \frac{c^*_B}{r^*_r B}, \frac{k^*_B}{p^*_B} < 0 \). As a result the B goods balance of trade may either improve or deteriorate \( (p^*_B (\frac{c^*_B}{p^*_B} + \frac{c^*_B}{r^*_r B}) + r^*_B (\frac{k^*_B}{p^*_B} + \frac{k^*_B}{r^*_r B}) > 0), \) depending on the relative size of each term.

We would expect that the first bracketed term of (198), reflecting the deterioration due to the price changes alone, and the first term of the second bracketed expression, reflecting the deterioration in A-goods, to outweigh the second term of the seconded bracketed expression, reflecting the change in B-goods trade (which may be negative or positive), and therefore the total trade balance would deteriorate. This roughly corresponds to the Polish situation in 1975. The terms of trade were approximately constant (they actually increased slightly, 0.2%), as
foreign currency prices increased 14.2% for exports and 14.0% for imports. Poland was running a balance of trade deficit of -7,198 million zloty and was a net importer of food beverages, tobacco (c_A, c_B), raw materials, machinery and equipment (k_B for the most part but some k_A) and other manufactures (c_B, k_B), and a net exporter of fuels, electric power and chemicals (k_A for the most part but some k_B) (all S.I.T.C Classifications for total trade in current prices). Further, the balance of trade deteriorated as indicated by equation (198), but only slightly, 292 million zlotys or 4%.

The second and third cases, in which there is world inflation and a change in the terms of trade can now be considered as well. Letting  \( \theta_M = \hat{\theta}^*_A = \hat{\theta}^*_B = \hat{r}^*_B \) and  \( \theta_x = \varphi^*_A \) we can write equation (196) as:

\[
(199) \quad d\mathbf{B}^* = -[\theta_X r^*_{A^*} k_A + \theta_M (P^*_A c_A + P^*_B c_B + \hat{r}^*_B k_B)] \\
+ \theta_M [P^*_A (\tau^*_{c_A} + \tau^*_A) + \hat{r}^*_A (\tau^*_A + \tau^*_B)] + \\
+ \theta_M [P^*_B (\tau^*_{c_B} + \tau^*_B) + \hat{r}^*_B (\tau^*_B + \tau^*_B)]
\]

Now defining \( t = \frac{\theta_M}{\theta_X} \), and \( d^* = \frac{V_m^*}{V_x^*} \) where \( V_x^* = r^*_A E^d_A \)

and \( V_M^* = (P^*_A c_A + P^*_B c_B + \hat{r}^*_B k_B) \) we have
We can now see more clearly that the change in the foreign currency balance of trade depends upon the terms of trade, \( t \), the initial balance of trade, \( d^* \), and the relevant elasticities.

Let us consider, as an example, the case of Poland in 1971 and 1972. In 1971 Poland faced a balance of trade deficit of $662 million zloty, with imports of 16,151 million zloty and exports of 15,489 million. By 1972 export prices had increased 1.4 percent and import prices fell 0.4 percent, clearly improving the terms of trade. Using this information to compute the first term in equation (200)

\[
(t = -0.285, \frac{1}{t} = -3.5, d^* = 1.043, V_x^* = \frac{15,489}{R}, \theta_M = -0.004)
\]

we find that the balance of trade should improve in the short run when there are no changes in real trade flows. We have

\[
\text{dB}^* = (-0.004)\left(\frac{15,489}{R}\right)(-3.5 + 1.043)
\]

\[
\text{RdB}^* = +152.23 \text{ million zlotys.}
\]

However the second term of (200), which allows for changes
in trade flows in response to price changes may offset this. If we assume that the own price effects dominate the cross effects then \( P^*_B (\tau^c_B + \tau^c_B) \) and \( r^*_B (\tau^k_B + \tau^k_B) \) are positive. Since \( \theta_m \) is negative the balance of trade as a whole will deteriorate in this case if
\[
\frac{1}{R} \left[ P^*_B (\tau^c_B + \tau^c_B) + r^*_B (\tau^k_B + \tau^k_B) \right] > [-V_x (\frac{1}{L} + d^*) + \\
\frac{1}{R} (P^*_A (\tau^c_A + \tau^c_A) + r^*_A (\tau^k_A + \tau^k_A))].
\]

In fact the balance of trade in 1972 deteriorated as the deficit increased from 662 million zloty to 1,479 million. For the balance of trade to deteriorate by this large amount, equation (200) suggests that not only would B goods have to be a large portion of total trade but also that the supply and demand for B goods would have to be much more sensitive to B goods price changes (than the supply and demand for A goods).

The expression above reflects the change in the balance of trade resulting from the change in foreign currency prices which is eventually manifested as a change in the domestic price of B goods. It is clear, however, that this was not the only development which occurred during this period. Vanous [226] notes that during the early 1970s the relative-price developments on world markets contributed to the growth of trade deficits of East European countries as a group but this was not the case of Poland. We see above that between 1971 and 1972 the terms of trade effect
would have improved the balance of trade by 152.23 million zlotys when in fact the balance of trade deteriorated. This was for the most part due to "the ambitious Polish development program, based on heavy imports of Western technology and rapid growth of industrial production."²² The impact of the development program outweighs the terms-of-trade effect for this period and is even more pronounced in later periods.²³

In 1973 and 1974 the deterioration in the balance of trade as a result of the development program is compounded by the terms-of-trade effect. This is an example of the third case mentioned above as Poland, with a balance of trade deficit, was again faced with world inflation and the terms of trade turned against her. In 1973 prices increased 5.7% for exports, 8.8% for imports and the terms of trade deteriorated by 2.9%. The initial balance of trade deficit was 1,479 million zloty in 1972 as a result of exports of 18,133 million zloty and imports of 19,612 million. Equation (200) indicates that the initial impact of the change in the terms of trade alone would be a deterioration in the balance of trade. Substituting \( \theta_m = 0.088, V_x^* = 18,133, t = 1.54 \) and \( d^* = 1.08 \) we have:

\[
\text{RdB}^* = -2,758.97 \text{ million zloty.}
\]

The second term in equation (200), again, may either reinforce this or offset the deterioration (as it likely offset the improvement in the case in which the terms of trade improved
above). The balance of trade actually deteriorated by much more than the 2,758.97 million zloty which would have resulted from the change in the terms of trade alone. The emphasis on imported technology as a result of the new development plan outweighed any possible price effects which would serve to improve the trade balance as the balance deteriorated by 3,269 million zloty for a trade deficit in 1973 of 4,748 million zloty. It is clear as Wolf [241] notes "that we cannot draw simple conclusions about changes in the trade balance based solely on terms of trade trends." We must consider not only the price elasticities and the initial trade balance but also for the MCPE the central planners' response (in terms of other plan parameters) which may induce further changes in the supply of exports and demand for imports.

Since in all of the cases above the foreign currency balance of trade, and the devisa balance, change (even without a change in real trade flows) the profits (or losses) on price discrepancies will change as well. Then the problems central planners face with respect to changes in price equalization subsidies and potential changes in the domestic money supply, as outlined above for changes in the price of A-type consumer goods, will be encountered as well. The central planners may take actions to counter these developments similar to those described earlier.
In summary, we have outlined the impact of several types of exogenous disturbances upon the domestic economy of the hypothetical MCPE. In the simple case of an increase in the foreign currency price of A-type consumer goods the foreign currency balance of trade deteriorates and profits (losses in this case) on price discrepancies decrease (increase) if there is initially a balance of trade deficit on these goods. As a result the government budget surplus (deficit) decreases (increases) as price equalization subsidies (taxes) increase (fall). There is not necessarily a change in the flow supply of money. However, when foreign currency reserves are depleted, or there is no longer an opportunity to borrow reserves, the authorities must decrease expenditures, increase taxes or finally allow domestic prices to change. Changing the level of taxes, the example considered, is an effective policy tool for influencing the government budget surplus (or deficit) as indicated in equation (192) and for influencing the balance of trade as indicated in equation (194). The change in taxes which returns the balance of trade to equilibrium will only coincidentally be equal to the change in taxes which returns the government deficit to zero. Thus alternative policy tools must be used to achieve both targets simultaneously.

Another case in which the hypothetical MCPE imports $c_A$, $c_B$, and $k_B$ while it exports $k_A$ has also been considered.
Here, when all foreign currency prices increase, the effect upon the balance of trade is more complicated. There is an immediate impact due to the change in value of a constant flow of real goods. If the terms of trade improve this effect tends to improve the balance of trade. If the terms of trade deteriorate then the balance of trade does also. The second impact is a slightly longer-run effect in which households and enterprises react to the price changes. It may either improve or worsen the balance of trade but the most likely effect would be to worsen the balance. These effects outline only the impact of foreign currency price changes, assuming the central planners do not intervene and change other planning parameters. If the central planners do change the planning parameters, perhaps emphasizing the import of machinery as in the early 1970s, they may have an impact upon the balance of trade which outweighs the impact of the changes in foreign currency prices. This appears to have been the case in 1972 and 1973 when the changes in foreign currency prices indicated the potential for a deterioration in the balance of trade. In fact the deterioration was tremendous due not only to the price changes but also to the increased emphasis on imported equipment by the central planners (which could have been encouraged by increased subsidies or changes in $\alpha$). Let us now turn to an explicit analysis of the trade-off between external and internal balance.
Section 6.5 The Problem of Attaining Internal and External Balance

In the previous section several external shocks were considered and their impact upon the domestic economy and the balance of trade was outlined. In this section the means of attaining both internal and external balance, as defined in section 6.4, will be discussed. This problem was addressed by Portes [171] for a CPE, but his analysis appears to be flawed for several reasons, as discussed in Chapter 3. Portes' policy variables, or instruments, which the planners may use to influence both internal and external balance are the level of exports and the real wage, given the level of government expenditures. (25)

There are other potential instruments for the CPE, as Portes mentions, such as the level of government expenditures and the supply of consumer goods (if centrally determined). For the MCPE as developed above it is clear that prices play a more important role and that planners' control variables will be somewhat more indirect. We cannot use quantity controls in the MCPE as control variables since enterprises must be motivated or induced to produce given planned levels of goods and services. The control variables are those tools which planners have at their disposal to induce enterprises to produce at given levels. These variables, as discussed in Chapters 4 and 5 for a MCPE such as Poland, appear to be prices, subsidies,
government expenditures and taxes, and the weight on value added in the enterprise objective function. Thus, we may examine the internal balance-external balance trade-off when the central planners have these variables as tools to influence aggregate economic activity. Internal balance as defined in section 6.4 and in the traditional Western literature requires full employment and price stability. This implies first that aggregate output from all sources is equal to aggregate demand. Thus equilibrium in the expenditures sector requires:

\[(201) \ -E^d_G(P_A, g_{net}, \alpha) - B(P_A, r_A, g_{net}, \alpha, R) = 0 + - - +\]

where \(E^d_G\) is the excess demand for goods

\[E^d_G = P^d_A c^d_A + P^d_B c^d_B + r^d_A k^d_A + r^d_B k^d_B\]

and is written here only as a function of the parameters that the central planners control, \(g_{net} = g^d + g_s - T\), and all other symbols are as previously defined. Second, this implies that we have flow equilibrium in the money market, or:

\[(202) \ e^s(g_{net}) - m^d(a_{net}, \alpha), + - - -\]

where all symbols are as previously defined. External balance requires that the devisa balance of trade is zero:
\[ B'(P_A, r_A, \varepsilon_{net}, \alpha, R) = 0 \quad \text{or} \]

\[ \Pi(P_A, r_A, R) - B(P_A, r_A, \varepsilon_{net}, \alpha, R) = 0. \]

Now if the central planners desire price stability and have in effect fixed the prices of A goods and are reluctant to change them the use of prices as control variables will be limited. Similarly, the exchange rate also will be changed only reluctantly. This of course does not rule out the use of these parameters as controls but simply implies that \( \alpha \) and \( \varepsilon_{net} \) will be the parameters most likely to be of significance. Now let us consider graphically both internal and external balance when \( \alpha \) and \( \varepsilon_{net} \) are the relevant control parameters. In Figure 19 internal balance in the expenditure sector is depicted by the curve IBE, the locus of points which satisfies equation (201). The slope of the IBE curve is derived in Appendix G (along with the slopes of the other balance schedules), and is found to be:

\[
\frac{\partial \alpha}{\partial \varepsilon_{net}} \bigg|_{\text{IBE}} = \frac{1}{\left[ -\left( \frac{\partial E_d}{\partial \varepsilon_{net}} \right) - \left( \frac{\partial B}{\partial \varepsilon_{net}} \right) \right] - \left[ \left( \frac{\partial E_d}{\partial \alpha} \right) - \left( \frac{\partial B}{\partial \alpha} \right) \right] \left( \text{+ or -) } \right] > 0.
\]

A point such as point B represents excess demand for goods (or unemployment). To return to equilibrium in the expenditures sector would require a decrease in \( \varepsilon_{net} \), or an increase in \( \alpha \). For example, increasing taxes would
reduce $g_{net}$ and reduce wealth ($\bar{\omega}$, as outlined in section 4.6, equations (76) and (84)). The reduction in wealth reduces consumer goods demand by households and generates a movement toward the IBE locus. (Alternatively a reduction in $g_{net}$ by a decrease in government demand for goods, say, would reduce the level of excess demand directly and generate a similar movement toward the IBE locus). An increase in $\alpha$ would also bring about a movement toward the IBE locus since increasing $\alpha$ generates an increase in output (greater than the increase in demand for capital services inputs). (27)

![Diagram showing Internal Balance: Expenditures Sector]

Figure 19. Internal Balance: Expenditures Sector

The locus of all combinations of $\alpha$ and $g_{net}$ which guarantee equilibrium in the money market is depicted in Figure 20 by the IBM curve. The slope of the internal
balance curve for the monetary sector is also derived in Appendix G and is:

\[
\frac{\partial \alpha}{\partial \varepsilon_{\text{net}}} \bigg|_{\text{IBM}} = \frac{\left[ \frac{e^s}{\varepsilon_{\text{net}}} \left( \frac{e^d}{\varepsilon_{\text{net}}} \right) \right]}{\left[ \frac{-ma^d}{\partial a} \right]} < 0
\]

A point such as point B in Figure 20 represents a situation of excess supply of money balances or inflationary pressures. To return to equilibrium in the monetary sector would require, on the one hand, a reduction in net government expenditures, which reduces the flow supply of money in the form of enterprise deposits if the decrease in \( \varepsilon_{\text{net}} \) is due to a decrease in government demand for goods and services (or increases the flow demand for household money balances if the decrease in \( \varepsilon_{\text{net}} \) is due to an increase in household taxes). A reduction in \( \alpha \) will reduce inflationary pressures as well by inducing enterprises to hold more enterprise deposits. (This happens because an increase in \( \alpha \) induces enterprises to hire more factor inputs, produce more output and hold fewer money balances to do so. In effect \( \alpha \) influences the velocity of money in the enterprise sector.)

Finally the locus of all combinations of \( \alpha \) and \( \varepsilon_{\text{net}} \) which guarantee external equilibrium are depicted by the curve labeled EB in Figure 21. The slope of the curve is:
Figure 20. Internal Balance: Monetary Sector

\[ \frac{\partial \alpha}{\partial g_{net}} = \left[ -\frac{- \frac{\partial B}{\partial g_{net}}}{E_{net}} \right] > 0, \]

as derived in Appendix G. A point such as B in Figure 21 depicts a balance of trade deficit. To return to equilibrium requires a reduction in \( g_{net} \) or an increase in \( \alpha \). For example, if taxes are increased (to reduce \( E_{net} \)) household wealth falls, the demand for consumer goods falls and to the extent that these goods are imported the balance of trade will improve. (Alternatively a direct reduction in government demand for goods increases the amount of goods on domestic markets available for export.)
An increase in $\alpha$ increases total output, some of which may be exported, and therefore reduces the balance of trade deficit. (68)

![Graph showing external balance](image)

**Figure 21. External Balance**

Now if we combine all three loci we have in Figure 22 the combination of $\alpha$ and $g_{net}$ ($\alpha^*, g_{net}^*$) which is consistent with equilibrium in all three sectors (determined at point A, a notional equilibrium), and via Walras' law, full employment as well. The relative slopes of the IBE and EB loci are discussed in Appendix G along with the conditions for the dynamic stability (assuming that planners adjust $\alpha$ and $g_{net}$ in response to any disequilibrating force with knowledge of the impact of changes in $\alpha$ and $g_{net}$ upon each sector). Figure 22 now allows us to examine the impact of any exogenous disturbance in the foreign sector (or other
sectors), and determine what the appropriate policy response by the central planners (in terms of changing $a$ and $g_{\text{net}}$) would have to be in order to return the economy to equilibrium. This does not imply however that these policy actions will be taken. Unless central planners actually change $a$ and $g_{\text{net}}$ the economy remains at point A in $a$, $g_{\text{net}}$ space throughout the discussion below.

![Diagram](image)

**Figure 22. Internal and External Balance Loci**

As an example let us consider a foreign disturbance which causes a deterioration in the balance of trade. This may be, for example, an exogenous decrease in world demand for the MCPE exportable, or simply an increase in world prices as discussed in section 6.4.\(^{(29)}\) (The second
case is outlined above. Equations (184), (185), and (186) indicate the impact of a change in $P_A^*$ when there is an initial trade deficit and the MCPE is importing $c_A$. Equation (198) illustrates the more comprehensive example of the MCPE which imports $c_A$, $c_B$, $k_B$ and exports $k_A$. It was shown that the trade balance may deteriorate (in both real and nominal terms) with external inflation regardless of the initial trade balance. We assume here that the initial trade balance is zero and with the increase in world prices the trade balance deteriorates.) The increase in world prices and resulting deterioration in the trade balance may be illustrated by a shift in the external balance loci.

If we are initially at point $A$ the decrease in the balance of trade implies a shift in the $EB$ locus from $EB$ to $EB^*$, that is, point $A$ now represents a balance of trade deficit. There has been an increase in the demand for $c_A$, and therefore the import of $c_A$, since the domestic price has not changed and the domestic price of a substitute $c_B$, has increased. Similarly the increase in the domestic price of $k_B$ leads domestic enterprises to produce more $k_B$ and less $k_A$, which is exported. The trade balance on $A$ goods deteriorates. The trade balance on $B$ goods may improve or worsen and we assume that the total trade balance deteriorates (see the discussion of equation (198) above).
Although internal balance in the expenditures sector is maintained as long as the MCPE can alleviate any domestic excess demand or supply via world markets, the balance of trade deficit reflects a contraction of the domestic money supply and a decrease in real money balances, or wealth, as these balances flow abroad. As a result, the IBM locus shifts from IBM to IBM' which indicates that point A now reflects developing (or incipient) deflationary pressures. However, B goods prices are determined by world markets (and they have increased) and A goods prices are fixed by the central authorities. Thus, there are no domestic price changes to return the economy to equilibrium. The new (short run) internal balance would occur at point C (if α and g\text{net} were adjusted by the central planners) and could be maintained as long as the balance of trade deficit is financed by running down money balances. The domestic economy does not actually move to point C, however, even though the balance loci have changed, since α and g\text{net} have not changed.

The new general equilibrium, point C, is only temporary since real wealth falls as money balances flow abroad. There is a decrease in the demand for consumer goods by households, both A- and B-types are imported, even without a change in their prices. This tends to decrease the foreign trade deficit. The external balance locus then shifts toward its initial position from EB' to EB''. The improvement in the
trade balance then generates a secondary change in the money markets and a shift from IBM to IBM'. Eventually the new loci intersect at a point such as point D which reflects a new potential equilibrium. The actual movements from A to C to D require that both $\alpha$ and $\gamma_{net}$ are adjusted by the central planners as well. There are, as mentioned earlier, no guarantees that such actions will take place but here the correct policy actions would be to increase both $\alpha$ and $\gamma_{net}$, ultimately arriving at $\alpha_1$, $\gamma_{net_1}$.

Note that the new equilibrium may be a return to point A if the initial balance of trade reflected solely a decrease in net hoarding of money balances by households (since the wealth effect would eventually eliminate this). If some part of the trade deficit is due to additional net government expenditures which create the excess supply of money balances (see equation (182)) then the trade deficit will persist as the money balances created by the government simply flow abroad (EB remains at EB' or EB'' and the domestic money market is in equilibrium since there is no net hoarding or dishoarding by enterprises or households). Households and enterprises are in notional equilibrium in both the goods market and money market, at a point such as D. In general then the economy will not return to the initial equilibrium, point A, as long as the government is financing the trade deficit via money creation.
An alternative to adjusting $\alpha$ and $\delta_{\text{net}}$ in response to the foreign disturbance would be to limit the impact of the foreign disturbance by direct controls on foreign trade. Let us examine the impact of an increase in foreign currency prices when the government and central planners now impose direct trade controls on A-type goods (in addition to fixed domestic prices). Let us continue with the example of section 6.4 in which the hypothetical MCPE is importing $c_A$, $c_B$, and $k_B$ and exporting $k_A$. Since domestic currency prices of A-type goods are fixed, the change in the foreign currency prices of these goods does not affect trade flows directly (as outlined in section 6.4). However, the domestic currency prices of B-type goods do change. They will increase (due to the increase in foreign currency prices), and in addition to their impact upon the B-goods markets (which clear due to the flexible B-goods prices), there will be an increase in the demand for A-type consumer goods (substitutes) and a (possible) decrease in the supply of A-type capital goods. This is exactly what occurs in the model in section 6.4, but now trade controls on A-type goods will prevent the excess demand from being met by imports. As a result a state of persistent excess demand for A-type goods (as in the case of the closed economy model of Chapter 5, but for different reasons) will prevail. We find then, as a result of the persistent excess demand, that the relevant supply and demand functions will be the effective supply and demand functions. Only if there are both fixed
domestic prices on A-goods and trade controls on A-goods will there be persistent excess demand and the effective demand and supply functions will prevail. The economy moves away from point E in Figure 18, the unconstrained full employment level of output (notional internal balance) to a point such as A (a constrained equilibrium). In addition we find that in the attempt to limit deterioration in the trade balance the net result may be that the balance deteriorates more with controls than without! (The impact upon the level of profits (losses) on price discrepancies will be lessened and therefore the impact upon the government budget deficit or surplus will be lessened as well. See below.) Now let us examine the problem more closely.

Recall in section 6.4 that the balance of trade is described in equation 183, assuming full employment, as:

\[(204) \quad B = E_{ma}^d = -(P_A^d E_A^c + P_B^d E_B^c + r_A^d e_A^k + r_B^d e_B^k) - A.\]

The domestic price of A goods and the wage rate are fixed by the central planners. The domestic prices of B goods are determined by the world market: the foreign currency price times the exchange rate (which we assume is fixed). Now if we have an increase in foreign currency prices, assuming for simplicity that $r_B^*$ does not change, and a resulting increase in the domestic currency price of B-goods, we can express the potential change in the domestic currency balance of trade as:
(205) \[ dB = - \left[ E_{cB} dP_B + P_B \frac{\partial E_{cB}}{\partial P_B} dP_B + r_B \frac{\partial E_{kB}}{\partial P_B} dP_B \right. \]

\[ + \left. P_A \frac{\partial E_{cA}}{\partial P_B} dP_B + r_A \frac{\partial E_{kA}}{\partial P_B} dP_B \right]. \]

Note that there is no impact upon the domestic currency value of the balance of trade due to the change in \( P_A^* \) and \( r_A^* \) because \( dP_A = dr_A = 0 \).

Now if the central planners impose trade controls on A-goods, fixing not only their price but also the actual amount which may be imported and/or exported, the change in the domestic currency balance of trade will be only the change in B goods trade:

(206) \[ dB = - \left[ E_{cB} dP_B + P_B \frac{\partial E_{cB}}{\partial P_B} dP_B + r_B \frac{\partial E_{kB}}{\partial P_B} dP_B \right], \]

and there is excess demand for A-type goods equal to:

(207) \[ P_A \frac{\partial E_{cA}}{\partial P_B} dP_B + r_A \frac{\partial E_{kA}}{\partial P_B} dP_B. \]

(This limits the initial shift in the external balance loci in Figure 22 but does not eliminate it since B-goods are not subject to foreign trade controls. In fact the actual net shift, we find below, may actually be larger as the B-goods trade balance deteriorates more in this case than in the case without trade controls.) As the price of B-type consumer goods increases there are two effects. To the extent that A-type consumer goods are substitutes for B-type consumer goods the demand for A-type consumer goods
will increase and the supply will fall. Similarly the
demand for A-type capital services will increase by those
enterprises producing B goods and decrease by those enter-
prises producing A goods. (Let us assume that the net
effect is an increase in total demand for A-type capital
services. This does not have to be the case, however.)
Households then are forced to accumulate undesired balances
which they prefer to spend on A-type consumer goods.
Enterprises are also accumulating enterprise deposits which
they prefer to spend on A-type capital services. Previously
in Figure 22 the decrease in the money supply shifted the
IBM locus and generated changes in real wealth which affected
the expenditures sector and the trade balance. Now, since
both households' and enterprises' desired expenditures
are frustrated, these effects still occur but to a lesser
degree. Money balances are falling due to the foreign trade
deficit but this decrease is in part offset by the accumula-
tion of unwanted deposits which households cannot spend
on A goods. (Note that notional supply and demand functions
are no longer the relevant functions and the equilibria
that are represented by the balance loci of Figure 22 are
constrained equilibria. The new loci have the same
functional form but are defined using the effective supply
and demand functions discussed below and have the same
slopes as well.) Further, the balance of trade will not be
equal to the notional excess flow demand for money balances as it was in the equilibrium model.

If both households and enterprises are frustrated in their attempts to purchase commodities with fixed prices and there is a persistent excess demand for these goods, the relevant supply and demand functions are not the notional functions as above, but the effective supply and demand functions as derived in Chapter 5. The price of A-type goods is no longer the relevant parameter to consider. The amount of A-type consumer goods, \(c_A\), and A-type capital services, \(k_A\), enter the supply and demand functions. We have then, from sections 5.5, equations (139) through (149) the relevant supply and demand functions:

\[
(208) \quad \xi_A^S = \xi_A^S(w_A, \ldots, g_P, c_A) < \xi_A^S, \quad 0 \leq t \leq N^\prime
\]

\[
(209) \quad \xi_B^S = \xi_B^S(w_A, \ldots, g_P, c_A) < \xi_B^S, \quad 0 \leq t \leq N^\prime
\]

\[
(210) \quad c_A^d = c_A^d(w_A, \ldots, c_A) > c_A^d, \quad N < t \leq N
\]

\[
(211) \quad c_B^d = c_B^d(w_A, \ldots, c_A) > c_B^d, \quad 0 \geq t \geq N
\]

\[
(212) \quad m^d = m^d(w_A, \ldots, c_A) > m^d, \quad 0 \leq t \leq N^\prime
\]

(Recall from Chapter 5, the effective demand for A consumer goods prevails during the unconstrained period. The effective demand for B consumer goods and money during the constrained and unconstrained periods will have the same
functional form but in general the level of each will be different. The actual level of A-type consumer goods exchanged during the constrained period will be $c_A^t$. Some of these goods may now be either imported or exported.

For the enterprise sector we now have:

(213), (214) \[ c_i^s = c_i^s(P_A, \ldots, k_i^s) < c_i^s \quad 0 \leq t \leq \hat{N} \]

(215), (216) \[ k_i^s = k_i^s(P_A, \ldots, k_i^s) < k_i^s \quad 0 \leq t \leq \hat{N} \]

(217), (218) \[ k_i^d = k_i^d(P_A, \ldots, k_i^d) > k_i^d \quad 0 \leq t \leq \hat{N} \]

(219), (220) \[ e_i^d = e_i^d(P_A, \ldots, k_i^d) > e_i^d \quad 0 \leq t \leq \hat{N} \]

If the effective supply and demand functions prevail, then, in the case in which the hypothetical MCPE is importing $c_A$, $c_B$, $k_B$ and exporting $k_A$ (as in section 6.4), the change in the balance of trade will not be (206), but may be written as:

(221) \[
\frac{\partial E_i^d}{c_A} \bigg|_{c_A} = - \left[ \frac{\partial E_i^d}{c_B} \cdot \frac{\partial P}{\partial c_B} \cdot dP_B + \frac{\partial E_i^d}{k_B} \cdot \frac{\partial P}{\partial k_B} \cdot dP_B + \frac{\partial E_i^d}{\partial P} \cdot \frac{\partial P}{\partial P} \cdot dP_B \right]
\]

where """ indicates the excess demand functions are based upon the effective supply and demand functions. The three terms in (221) which describe the change in the balance of trade when there is a domestic shortage of A-type consumer goods (and a resulting shortage of labor which
constrains enterprises may now be compared with (206) which describes the change in the balance of trade in which there are no domestic shortages. We find that all three terms differ in magnitude.

From equations (211) and (212) we have \( c_B^d' > c_B^d \) and \( c_B^S' < c_B^S \). This indicates that \( E^d_{c_B} > E^d_{c_B} \) and as a result the level of imports of B-type consumer goods will be greater, when there is a shortage of A-type consumer goods, than when there is no shortage, at given prices. As a result, this term indicates that the increase in the domestic currency price of B-type consumer goods will cause the balance of trade on B-type consumer goods to deteriorate (or improve) in this case, in which there is a shortage of A-type consumer goods, by a greater (lesser) amount than in the case in which there is no shortage of A-type goods (due to a relatively larger inflow of B-type consumer goods caused by the unavailability of A-type consumer goods).

The second term indicates that the balance of trade will improve since the demand for B-type consumer goods (both effective and notional) will decrease as the price of B-goods increases. If however, the supply of labor is constraining enterprises, \( \frac{\partial c_B^S}{\partial p_B} = \frac{\partial k^S}{\partial p_B} = 0 \), then
\[
\left| \frac{\partial E^d}{\partial P_B} \right| < \left| \frac{\partial E^d}{\partial P_B} \right|. \text{ The improvement in the balance of trade in this case, in which there is a shortage of A-type consumer goods (which generates the labor supply constraint), will not be as great as the improvement when there is no constraint. The first two terms, then, indicate that the balance of trade (on B-type goods) will deteriorate by a greater amount in the case in which there are controls on A-type consumer goods, which constrain the behavior of households and enterprises, than in the case in which there are no constraints on their behavior, because the potential supply effects of the increase in the domestic price of B-type consumer goods have been eliminated by the labor constraint.}
\]

The third term, the impact of the increase in the price of B-type consumer goods upon the demand for B-type capital services, is positive in both cases (with and without foreign trade controls), indicating a deterioration in the balance of trade, and \( E^d_{kB} \) is likely to be greater than \( E^d_{kB} \). Therefore, the deterioration in the balance of trade for B-type capital services in the case in which there is a shortage of A-type goods (and the resulting constraint on the supply of labor), will be unambiguously greater than the deterioration in the case in which there is no shortage of A-type goods. Thus all three terms indicate that the
deterioration in the balance of trade on B-type goods will be greater when there are foreign trade controls on A-goods than when there are no controls.

It may be then that the balance of trade actually deteriorates more with trade controls than without. In the case under consideration the total potential deterioration (if there are no controls) in the balance of trade is the actual deterioration on B-goods (equation (206)) plus the deterioration on A-goods (equation (207)). The trade controls eliminate the deterioration on A-goods but worsen the deterioration on B-goods. Thus, if

\[
(222) \quad \frac{dE^d}{c_A - dB_B} > \left| PA \frac{\partial E^d_A}{\partial dP_B} \frac{\partial A_d}{\partial dP_B} + r_A \frac{\partial E^d_K}{\partial dP_B} dP_B \right|
\]

i.e., if the deterioration on B goods due to the trade controls on A-goods is greater than the deterioration on A-goods that would occur without the trade controls, then the total trade balance deteriorates more in the case with controls.

A case in which this may happen is when the increase in the price of B consumer goods generates a shortage of A consumer goods and this shortage generates a large labor supply response. That is, the decrease in output due to the labor shortage (and associated multiplier effects), reflected by the movement from point E to point A or \(A'\) in Figure 18, is large. This increases the domestic shortage of both A and B goods, and B goods will flow in from
abroad (and the greater the substitutability between A and B consumer goods the greater the inflow of B-goods and the more likely the perverse deterioration in the trade balance when controls are imposed). The central planners then may not only be frustrated in their attempts to maintain external balance by imposing trade controls but also will move the economy from a point such as E in Figure 12 to one such as A or A', representing an effective internal balance, but at a lower level of output and employment than the notional balance at point E.

With respect to Figure 22 the internal and external balance loci now represent effective balance rather than notional, with no qualitative change in the loci themselves, since the signs of the partial derivatives of each function in equations (201), (202), and (203) do not change. The difference then is only the magnitude of the shifts in the loci.

The initial shift in the external balance loci, from EB to EB' will not be as large (due to the trade controls) and therefore neither will the shifts in the internal balance loci (IBM to IBM'). The price changes which are generated in the constrained case will have less impact in the expenditures sector (on the production of goods since labor is constraining enterprises). But the wealth effect will be dampened as well. Thus, the secondary shifts of the balance loci, EB' to EB'', and IBM' to IBM'' will
be less. There may now be a larger balance of trade deficit (measured by the distance between point A, the initial equilibrium point and the new external balance loci EB'). Again the economy may move to a new point of equilibrium such as point D if α and g_{net} are adjusted but there are no automatic forces to guarantee this. Only if central planners increase α and g_{net} appropriately will such a movement occur. That is, the foreign trade controls may be counterproductive in the sense that even larger changes in α and g_{net} are necessary to achieve both internal and external balance.

The central planners then may be entirely frustrated in their attempt to limit or prevent a deterioration in the trade balance by imposing trade controls. However if trade controls were imposed with the intent of limiting the change in price-equalization subsidies (or taxes) the central planners may be effective in doing so (at the cost of a greater trade deficit). This is true since the flow of A-goods does not change in this case and therefore the level of price equalization subsidies (taxes) will change only to the degree that foreign currency prices have changed. From (163), assuming the hypothetical MCPE is importing c_A and exporting k_A, as in the example above, we have:
(223) \[ \Pi = (P_A - R_P^*)E_{c_A}^d - (r_A - R_{r_A}^*)E_{k_A}^d. \]

To consider the potential difference in profits due to price discrepancies between the case with controls and without let us assume that the FTO is earning profits due to price discrepancies. If initially \( P_A > R_P^* \) and \( r_A < R_{r_A}^* \), the FTO will clearly be earning profits. Now if foreign currency prices increase, continuing the example above, and there are no trade controls, we have:

\[
d\Pi = R(E_{k_A}^d dr_{A^*}^* - E_{c_A}^d dP_B^*) + (P_A - R_P^*) \frac{\partial E_{k_A}^d}{\partial P_B} dP_B - \frac{\partial E_{k_A}^d}{\partial r_A} \left( \frac{\partial E_{k_A}^d}{\partial P_B} dP_B + \frac{\partial E_{k_A}^d}{\partial r_B} dr_B \right).\]

If \( \frac{dr_{A^*}^*}{r_A^*} = \frac{\partial P_A^*}{R_{r_A}^*} = \psi \), then the change in profits depends on the size of the price change, \( \psi \), and the initial balance of trade on \( A \)-goods. If the balance of trade on \( A \)-goods is initially zero (the first term is zero), then profits increase since the second term is positive and the third is negative. If the balance of trade is initially positive the first term is also positive and the increase in price equalization profits is that much larger.

However, if there are trade controls on \( A \)-goods the change in price equalization profits is limited to the change in the foreign currency value of \( A \)-goods and may be written as:
\[ dM^* = R(\sum_{k_A^d} dr_{A^*}^d - \sum_{c_A^d} dp_{A^*}^d) \text{ and } dM^* < dM. \]

That is, the level of price equalization profits (losses) does not increase (decrease) as much, in this case, when there are trade controls, as in the case in which there are no trade controls on A-goods.

Thus we have seen that world inflation has several effects upon the hypothetical MCPE in which trade controls have been imposed on A-goods (which also have fixed prices domestically). First, disequilibrium in the domestic economy is generated and there is a reduction in the level of output and employment, from equilibrium market clearing levels (a movement from point E to point A or A' in Figure 18). Second, the trade controls may actually worsen the trade balance rather than improve it or limit its deterioration (as indicated by the distance between point A the initial equilibrium and the external balance loci EB' in Figure 22). And third, regardless of whether the trade balance improves or deteriorates, under the conditions outlined above the fluctuation in price equalization profits will be less when there are controls than when there are no controls, simply because there is no change in real trade flows of A goods.
Section 6.6 Summary

In this chapter we have developed an open model of the hypothetical MCPE. The model was then used to examine the impact of exogenous changes in world prices upon the domestic economy in an internal balance-external balance framework. Sections 6.1 through 6.3 develop the model. Section 6.4 defines internal and external balance and following Wolf [241], [238], [237] the impact of exogenous price changes upon the balance of trade, the level of price equalization subsidies (taxes), and the government budget surplus (deficit) is determined. In addition, a change in domestic taxes was considered as a means of balancing the government budget and in a second case as a means of returning to external equilibrium.

A graphical presentation of the internal balance-external balance problem was presented in section 6.5. The primary policy tools that central planners use to maintain balance are assumed to be net government expenditures and the weight on value added. We consider an exogenous change which causes a deterioration in the trade balance and find that the central planners must, in general, change both control parameters to return to both internal and external balance. We also consider the use of foreign trade controls on A-goods as a means of limiting the balance of trade deterioration. We find that the balance of trade may
actually deteriorate more with trade controls on A-goods than without the controls. However, the imposition of trade controls will lessen the change in price-equalization profits (losses).

In the next chapter we discuss the major implications of the model, some of its limitations, and problems of empirical application.
Notes to Chapter 6

(1) Plowiec [167] notes that in Poland "the domestic suppliers [may] . . . , independently of whether they export goods through the foreign trade enterprise operating as a buyer for its own account or as a commission agent, receive for the export goods--at a given level of the conversion factor--transactional prices . . . " Here the conversion factor is analogous to the exchange rate and transactional prices the domestic price.

(2) We assume for simplicity that there is only one exchange rate, R, for imports and exports and A and B goods. In practice there may be several differentiated exchange rates for different types of goods.

(3) See Teske, Gary R. [210] and Melson, Kathryn and Edwin Snell [151], for evidence that in fact remittances from abroad in the case of Poland are substantial.

(4) See Ames [8], Chapter 13, for a description of the FTO and Quigley [ ] for a description of the numerous FTOs of the Soviet Union.

(5) We later substitute $E^{d}_{C_A}$ for $c^{s}_{A} - c^{d}_{A} - E^{d}_{C_A}$, etc., to represent the excess flow demand for A-type consumer goods. With no trade controls this simply flows abroad as a demand for imports or supply of exports.
(6) Note that $c^d_{A, FT} = E_{c_A} - g_{c_A}$ in the expression for DR and $c^s_{A, FT} = 0$ in the expression for DE when $c^d_A + g^d_{c_A} > c^s_A$. Similarly $c^s_{A, FT} = E_{c_A} - c^d_A - g^d_{c_A}$ in the expression for DE and $c^d_{A, FT} = 0$ in the expression for DE when $c^d_A + g^d_{c_A} < c^s_A$. We are assuming that $c_A$ is either exported or imported, but not both. Similarly for $c_B$, $k_A$ and $k_B$ in each of these expressions and for the case in which the trade flows are evaluated in foreign currency prices below.

(7) We assume, as is usually the case, that profits or losses on price discrepancies are completely offset. An interesting problem arises if they are not, however. If the FTO then accumulates deposits (if profits are earned) on its own account and may use them as it desires the FTO is no longer a passive actor and the problem becomes somewhat more complex.

(8) The government budget in Poland has a "balancing fund" for just such a purpose. See Rocznik Statystyczny [185], various issues.

(9) We maintain the distinction between $f^S$ and $e^S$, and carry through the FTO's demands for money balances even though they net out when price equalization
subsidies are introduced. This allows us to examine the impact upon these flows of deposits when foreign currency prices change. It is of particular interest when the FTO may be permitted to spend the balances domestically.

(10) For further details see Wolf [241].

(11) Wolf [241], p. 41.

(12) Wolf [237] also examines the impact of exchange rate adjustments on the trade balance in CPEs and MTEs. Note though, that he does not make the distinction between notional and effective balance as we have done above.

(13) The supply elasticities embody the familiar Holzman-type bottleneck multipliers. See Holzman [101].

(14) Below we may refer to profits on price discrepancies even though they are losses. That is, \( \pi \) is simply negative in such cases. Similarly, \( A \), may be referred to as taxes but when negative is actually subsidies.

(15) Fallenbuehl, Z. M. [64].

(16) See section 4.6 for the details of the adjustment to a change in taxes, \( T \).

(17) As of 1971, Plowiec [167], p. 62, notes that "the system of establishing prices for imports has been applied only to machinery and installations and some raw materials not produced domestically." These we consider as \( k_{D} \). Although it is not true that consumer goods are
not exported we assume for simplicity that both are imported only. Again Plowiec [167], p. 17, notes that the import of certain consumer goods should be controlled. These we consider $c_A$.

(18) The first case, world inflation with constant terms of trade is roughly analogous to the Polish situation in 1975. The terms of trade, for total trade, actually improved but only slightly, .2%. (For trade with advanced industrial countries only they improved 5.1%) In 1971 the terms of trade (for total trade) improved by 4.3% (13.8% for trade with the advanced industrial countries). These years are analogous to case two, world inflation with an improvement in the terms of trade. The third case, world inflation and a deterioration in the terms of trade occurred in 1973 and 1974 as the terms of trade (for total trade) deteriorated by -2.8% and -.5% respectively. (For trade with the advanced industrial countries the terms of trade deteriorated by -8.8% in 1973 but improved 9.4% in 1974.) The terms of trade also improved in 1976 but deteriorated in 1977. See Fallenbuehl, et al. [67], p. 56, for data pertaining to 1971-1975 and Fallenbuehl [64], p. 37 for 1976 and 1977.

(19) See Fallenbuehl, et al. [67].

(20) This expression is similar to Wolf [241] expression-(1) and (10b) except that we are considering the foreign
currency balance of trade. Wolf considers in (1) only an exogenous change in foreign currency prices and exports for the small open economy and in (10b) the same changes for the CPE. Here we are considering changes in the foreign currency prices of imports and exports, as well as the changes in imports and exports induced by those price changes. Our example assumes that households and some enterprises (particularly B-type enterprises) are free to import or export goods on their own. Changes in the flow of imports are not considered in (10b) by Wolf since they are assumed to be completely controlled by the central planners.

(21) See Fallenbuchl, et al. [67] as mentioned in footnote 18 for further details.

(22) Vanous [226], p. 8.

(23) In this case, when the terms of trade improve in 1972, the terms of trade effect would indicate an improvement in the balance of trade. The longer run effect, the second term in expression (200), indicates the balance of trade may deteriorate if the own price elasticities are greater than the cross price elasticities. This longer-run effect, alone, without the development program emphasizing Western imports may have been enough to cause the deterioration in the balance of trade.
(24) Wolf [241], pp. 7, 8.


(26) We must continue to emphasize that it is incorrect to assume that prices are constant as Portes does. If they in fact are constant then the central planners are successful in attaining this particular goal. Portes' internal balance goal is full employment, which reduces to zero excess demand for goods via Walras' Law if the money market is in equilibrium. Portes implicitly considers all markets, yet he ignores equilibrium in the money market, as well as the labor market (Portes [171], p. 337). Thus the internal balance definition is inappropriate since it may actually be combinations of internal imbalance on the labor and money markets which net to zero. His assumption of fixed prices avoids the problem of price stability as a goal of the central planners since zero inflation (incipient, or repressed) is not achieved by fixing prices.

(27) We have assumed that

\[
\begin{pmatrix}
\frac{\partial c_A^s}{\partial \alpha} & \frac{\partial c_B^s}{\partial \alpha} & \frac{\partial k_A^s}{\partial \alpha} & \frac{\partial k_B^s}{\partial \alpha}
\end{pmatrix}
\begin{pmatrix}
\frac{\partial k_A^d}{\partial \alpha} & \frac{\partial k_B^d}{\partial \alpha}
\end{pmatrix}
\]

as discussed in Chapter 4. See Appendix G.

(28) Again we assume that the increase in output due to \(d\alpha\) is greater than the increase in demand for inputs and that the share of inputs which are imported
is not unusually large (larger than the share of the output which is exported).

(29) An exogenous decrease in exports will shift the EB locus in a manner similar to the example of the increase in world prices outlined above. However, if the MCPE cannot sell all of the goods it produces then there is also excess supply on domestic markets. This shifts the IBE locus to the right. The new potential equilibrium will be determined on the new IBE locus in a manner similar to that outlined in the text.

(30) We assume only the price of B-type consumer goods increases because it is the excess demand by households which generates the labor market disincentives which constrain enterprises.

(31) If \( \frac{\partial k_B^d}{\partial P_B} = \frac{\partial k_B^d}{\partial P_B} \) then \( E_{k_B}^d < E_{k_B}^d \) because \( \frac{\partial k_B^s}{\partial P_B} \) is assumed to be zero (if labor is the actual constraint on the enterprises producing B-type capital services). However, it is likely that

\[ \frac{\partial k_B^d}{\partial P_B} > \frac{\partial k_B^d}{\partial P_B} \] and \[ E_{k_B}^d > E_{k_B}^d \] because as the supply of B-type consumer goods increases, producers demand more factor inputs. If they cannot obtain A-type
capital services they will demand more B-type capital services than otherwise. If this is the case, and

\[ E^d_{k_B} > E^d_{k_B} \]

the balance of trade would clearly deteriorate by a greater amount when there is a shortage of A-goods which cannot be met by imported goods.
Chapter 7: Contributions of the Model, Simplifying Assumptions, Suggested Empirical Analysis, Extensions and Future Research

7.0 Introduction

In the previous chapters the foundations of economic behavior in the MCPE were presented and an economic model of the hypothetical MCPE was developed incorporating many of the characteristics of the Polish economy. The model provides a consistent framework for analyzing the behavior of economic agents in the hypothetical MCPE. In section 7.1 the major results of Chapters 4, 5, and 6 are summarized. We discuss several of the model's simplifying assumptions and the implications of these assumptions with respect to estimating the model in section 7.2. Section 7.3 briefly discusses a linear specification of the model which is presented in Appendix H and several of the testable hypotheses are outlined. Section 7.4 then presents suggestions for future research and extensions of the model.

7.1 Contributions of the Model

The model of the hypothetical MCPE was developed in several stages. Chapter 4 considered the behavior of the agents of the economy in an equilibrium closed economy framework while Chapter 5 considered the same agents in a disequilibrium setting. The model was opened to foreign
trade in Chapter 6 and the impact of several foreign
disturbances on both internal and external balance was
considered.

In Chapter 4 the microeconomic foundations of the
hypothetical MCPE were analyzed in the equilibrium, market
clearing framework. The household's demand for money and
consumer goods and supply of labor services was derived,
assuming that households maximize utility (a function of
consumer goods, leisure, and public goods) subject to a
budget constraint and an initial level of wealth. Enter-
prises were assumed to maximize an objective function which
is a linear combination of profits and value added. The
relative weight that each of these is assigned in the
enterprise's objective function is a control variable of
the central planners. After deriving the supply of output
and demand for factor inputs the optimal conditions for the
hiring of labor and capital services were derived and
compared to the profit maximizing firm. It was found that
the enterprise in this hypothetical MCPE would tend to
utilize labor (relative to capital services) when compared
to the profit maximizing firm. The government's
behavior was also outlined in this chapter. Government
expenditures are financed either via taxes or an increase
in the money supply.
The model was aggregated and market clearing conditions were illustrated graphically. Two exogenous changes were then considered: the first in the level of taxes, the second in the relative weight of value added in the enterprise objective function. It was found that when taxes are decreased there is an increase in household wealth, which causes an increase in demand for consumer goods and a decrease in the supply of labor. This generates increases in the wage rate and the price level which, if equiproportional, will return the real wage and the level of wealth to their equilibrium levels. When the weight of value added in the enterprise objective function is increased we found that the impact upon the real wage, the real cost of capital services and the level of wealth depends upon the own and cross price elasticities of demand and supply of labor, capital services, output, and money, as well as the wealth elasticities of demand for output and household money and supply of labor. In general we found that the real wage will increase when the weight on value added increases, but changes in the real cost of capital services and wealth depend upon the exact values of the elasticities mentioned above.

Chapter 5 extended the model developed in Chapter 4 to allow for excess demand in both the goods and labor markets. The model was disaggregated explicitly to consider A- and B-type goods and we showed that with fixed prices
(on A-type goods and labor) there is potential excess demand for goods and labor. The behavior of both enterprises and households was examined and the divergence between the notional and effective supply and demand functions was emphasized. Under conditions of fixed nominal prices and wages, the levels of output and employment which result (an effective equilibrium) were found to be below the full employment levels (when wages and prices are flexible and all markets clear). In the MCPE, as the number of B goods (with flexible prices) was increased, the level of excess demand was reduced, and the economy moved from one con- strained equilibrium to another, increasing the levels of output and employment (a movement from A to A' in Figure 18). Central planners may not desire the increased levels of output and employment, however, because with these gains came changes in prices and wages, and therefore the distribution of income and wealth.

Chapter 6 considered the open economy model of the hypothetical MCPE. After a brief discussion of the institutional framework several exogenous, external disturbances were considered. The impact of the disturbances upon the domestic economy were discussed: namely the impact upon the balance of trade, price equalization taxes (subsidies), and the government budget deficit (surplus). Then a graphical exposition of a disturbance which caused a balance of trade deficit was presented in an internal
balance-external balance framework. The impact upon the level of employment and the money markets was outlined and the appropriate adjustments of the control parameters, α and gnet, were presented. A second example, in which trade controls on A goods were introduced as a means of limiting the deterioration in the trade balance, was also considered. It was found that as a result of the trade controls and fixed domestic prices there is domestic excess demand which may cause a decrease in the labor supply and a resulting decrease in employment and output (as in Chapter 5). The net result was that the economy moves from a point such as point E to a point such as A or A' in Figure 18 and the actual deterioration in the balance of trade may be greater with the controls than without. Thus the central planners may be completely frustrated in their attempts to use foreign trade controls as an instrument to alleviate a deterioration in the trade balance.

7:2 Simplifying Assumptions

One major problem that we are faced with is ascertaining whether a particular good is planned and has a fixed price determined by the central planners (i.e. it is an A good) or whether it is planned at the WOG or enterprise level and its price is variable (i.e. it is a B good). We have simplified by assuming that all goods can be classified as either A or B goods. As a practical matter there are several difficulties which we encounter.
The first is that there are no documents available explicitly classifying commodities as either planned and fixed price or unplanned flexible price goods. Although it is generally agreed that commodities may be classified as such, any attempt to do so must be done by analyzing actual (ex-post) data on commodity transactions and prices, or by more casual references in economic articles and statistical bulletins. It is of course then difficult to ascertain whether a particular price change resulted from planners' decisions (in the case of A goods) or market forces (in the case of B goods) and categorize the good accordingly. This problem is further compounded by the fact that during the period under consideration a particular commodity may be classified as a B good for some time and then price controls and more strict quantity controls (especially in foreign trade) may be imposed. Thus the B good suddenly becomes an A good. The effective period for which we can classify goods as A goods or B goods becomes so short as to be impossible to use for empirical analysis.\(^{(1)}\)

A second problem closely related to this is that some products, for example basic foodstuffs, are sold on state controlled markets at fixed prices and may be classified as A goods, and yet are also produced and sold independently at free market prices. Evidence in various issues of *Biuletyn Statystyczny* (the tables entitled "Retail prices of some foodstuffs in retail trade and in free market transactions,"
and "Index numbers of retail prices of goods and services bought by the population") indicates that there are dozens of such commodities.

During the period under consideration there were two major price reforms (January 1, 1971 and January 1, 1975) which concerned domestic prices of producers goods. Retail prices (official) were kept stable but in Fallenbuehl, et al., [67], it is noted that official data do not necessarily show the full extent of price increases due to the introduction of new products. Some products are simply labeled "new" and qualify for changes in prices (a problem quite common to market economies in which there are price controls). Further, "authorities are interested [in] maintain[ing] the stability of the official price index [and] therefore control prices of those commodities that are recorded in the index and allow increases" in others, especially new products. Thus official data may not accurately reflect price changes.

The basic model presented in Chapters 4 through 6 also assumes that the enterprise is relatively free to respond to prices and signals of the central planners. As a result direct administrative controls play a relatively small role. The central planners simply provide enterprises the proper incentive, via prices, subsidies or adjustments to the weight on value added, to attain a
particular planned level of output. The model thus explains the short run behavior of the actors in the economy within the plan period assuming a relatively high degree of autonomous, decentralized decision making. However, as early as 1974 the new system was not functioning strictly according to the reform guidelines. Managers were under pressure to maximize "production added" but at the same time they occasionally received "informal" instructions from Warsaw which suggested that enterprises should produce certain goods in "the public interest." In addition, workers were demanding wage increases inconsistent with the financial rules, and local party officials pressured managers to avoid doing anything which might lead to a strike or riots. (3)

Further, the rapid world inflation in 1974 (which led planners to revise downward the level of planned imports and increase planned exports), coupled with the high rate of growth of the Polish economy created excess demand domestically. As a result planners, acting perhaps instinctively, reintroduced some quantitative targets and froze enterprise funds to limit expenditures on factor inputs in short supply. Efforts to increase efficiency by allowing WOGs to allocate inputs were hindered as a result.

(These problems may be considered as practical problems in developing a model of the NCPE, but to the extent that
the assumptions of Chapters 4 through 6 are met the model as developed there may be taken as a reasonable abstraction of the Polish situation from 1972 on. Further, the restrictions placed on enterprises as a result of the problems which arose in 1974 may be temporary, since the 1976-1980 Five Year Plan called for the continuation of the development strategy of the previous five year plan and two conferences in 1978 emphasized the need for further economic reform. The plan calls for further improvements in the standard of living with stress on better utilization of productive capacity and increasing labor productivity.

Another problem concerns measuring the weight attached to value added in the enterprise objective functions, \( \alpha \). In our model we have assumed that \( \alpha \) is an easily measurable coefficient and that it is the same across all industries, or at least constant within industries or within the two sectors, A and B. However, as a practical matter there is no guarantee that this would be the case. It may be that planners adjust \( \alpha \) quite often and among enterprises within the same industry. Ultimately \( \alpha \) depends on the precise way in which wages and salaries are linked to value added and bonuses are linked to profits. It would appear to be extremely difficult to obtain adequate data to estimate for different industries and only an estimate for the socialist economy as a whole has been made.
A simplifying assumption made above when the economy was opened concerns the exchange rate or foreign exchange coefficients. We have assumed that there was one single exchange rate for all traded goods. As a practical matter the exchange coefficients vary according to region and commodity group. It is not clear how often, or to what extent central planners use differential exchange rates to actually influence the direction of or composition of trade, or whether the exchange rates are still only an accounting tool as has been traditionally thought.

7.3 Empirical Respecification

The model developed in the preceding chapters presents a strong theoretical basis for the micro-behavior of households and enterprises in the hypothetical MCPE. It should be clear that the model as outlined in Chapter 6 cannot be estimated as a macro-econometric model without some modification. The basic modifications are due simply to aggregation and construction of price indices. There are several alternatives which could be suggested but the specification below is meant to serve as an initial suggestion, assuming the necessary data are available.

From the equations of Chapter 6 the model in a general form may be written as:

\[
(224) \quad c^d_A = c^d_A \left( \frac{w}{p} \frac{P_A}{P} \frac{P_w}{P} \frac{\Omega}{P} \frac{\delta_p}{P} c_A \right)
\]
\[(225) \quad c_B^d = c_B^d(w, \frac{P_A}{P}, \frac{P_B}{P}, \Omega, \xi_P, \bar{c}_A)\]

\[(226) \quad \xi_A^s = \xi_A^s(w, \frac{w_A}{w}, \frac{w_B}{w}, \frac{\Omega}{w}, \xi_P, \bar{c}_A)\]

\[(227) \quad \xi_B^s = \xi_B^s(w, \frac{w_A}{w}, \frac{w_B}{w}, \frac{\Omega}{w}, \xi_P, \bar{c}_A)\]

\[(228) \quad \Omega = \int_{t=0}^{t=n-1} (w_A^s + w_B^s + b - T - P_A c_A^d - P_B c_B^d) dt\]

\[(229) \quad P = \lambda_A P_A + \lambda_B P_B\]

\[(230) \quad w = a_A w_A + a_B w_B\]

\[(231) \quad c_A^s = c_A^s(w, \frac{P_A}{P}, \frac{P_B}{P}, \frac{w_A}{w}, \frac{w_B}{w}, \frac{r_A}{r}, \frac{r_B}{r}, \xi_s, \alpha, \bar{k}_A, \bar{\xi}_A)\]

\[(232) \quad c_B^s = c_B^s(w, \frac{P_A}{P}, \frac{P_B}{P}, \frac{w_A}{w}, \frac{w_B}{w}, \frac{r_A}{r}, \frac{r_B}{r}, \xi_s, \alpha, \bar{k}_A, \bar{\xi}_B)\]

\[(233) \quad k_A^s = k_A^s(w, \frac{P_A}{P}, \frac{P_B}{P}, \frac{w_A}{w}, \frac{w_B}{w}, \frac{r_A}{r}, \frac{r_B}{r}, \xi_s, \alpha, \bar{k}_A, \bar{\xi}_A)\]

\[(234) \quad k_B^s = k_B^s(w, \frac{P_A}{P}, \frac{P_B}{P}, \frac{w_A}{w}, \frac{w_B}{w}, \frac{r_A}{r}, \frac{r_B}{r}, \xi_s, \alpha, \bar{k}_A, \bar{\xi}_B)\]

\[(235) \quad \xi_A^d = \xi_A^d(w, \frac{w_B}{w}, \frac{P_A}{P}, \frac{P_B}{P}, \frac{r_A}{r}, \frac{r_B}{r}, \xi_s, \alpha, \bar{k}_A)\]

\[(236) \quad \xi_B^d = \xi_B^d(w, \frac{w_A}{w}, \frac{w_B}{w}, \frac{P_A}{P}, \frac{P_B}{P}, \frac{r_A}{r}, \frac{r_B}{r}, \xi_s, \alpha, \bar{k}_A)\]

\[(237) \quad k_A^d = k_A^d(w, \frac{w_B}{w}, \frac{w_A}{w}, \frac{P_A}{P}, \frac{P_B}{P}, \frac{r_A}{r}, \frac{r_B}{r}, \xi_s, \alpha_A(\xi_A + \xi_B))\]
\[ (238) \quad k^d_B = k^d_B \left( \frac{w_A}{w}, \frac{w_B}{w}, \frac{P_A}{P}, \frac{P_B}{P}, \frac{r_A}{r}, \frac{r_B}{r}, \varepsilon^s_S, \alpha^s_B, (k^d_A + k^d_B) \right) \]

\[ (239) \quad E = \int_{t=0}^{t=n} \left( P_A c^s_A + P_B c^s_B + r_A k^s_A + r_B k^s_B - w_A k^d_A - w_B k^d_B - r_A k^d_A - r_B k^d_B - b + \varepsilon^s_S \right) dt \]

\[ (240) \quad r = \mu_A r_A + \mu_B r_B \]

\[ (241) \quad e^s + \bar{r}^s = \varepsilon^d + \varepsilon^s - T - A \]

\[ (242) \quad \kappa_A^s + \kappa_B^s = \kappa_A^d + \kappa_B^d, \kappa_1^s = \kappa_1^d, i = A, B \]

\[ (243) \quad B = P_A (c^s_A - c^d_A - \varepsilon^d_A) + P_B (c^s_B - c^d_B - \varepsilon^d_B) + r_A (k^s_A - k^d_A - \varepsilon^d_A) + r_B (k^s_B - k^d_B - \varepsilon^d_B) \]

\[ (244) \quad \Pi = B^s_A - B^s_A \]

The above equations capture the essence of the model as developed earlier and will allow the testing of several hypotheses. We have specified that there is a distinction in the weight of value added in the enterprise objective function between sectors (\( \alpha_A \) and \( \alpha_B \), with \( \alpha_B \) possibly less than \( \alpha_A \)) and a distinction in the level of subsidies between sectors (\( \varepsilon^A_S \) and \( \varepsilon^B_S \), with \( \varepsilon^A_S \) likely to be greater than \( \varepsilon^B_S \) as mentioned as a likely possibility in Chapters 4 and 5. Further \( k^d_A \), a constrained level of A-type capital services
is included as a possibility as well. Both are to be maintained as testable hypotheses at this point. The most important hypothesis to be tested is the role of the constraints of A goods in both household and enterprise behavior. Currently there is substantial debate in the literature about the existence of excess demand, or "repressed inflation" in the Soviet Union and Eastern Europe. In a recent exchange, Howard [107] argues that there is repressed inflation in the Soviet Union and that the Barro-Grossman model offers a reasonable explanation of household and enterprise behavior under such conditions. Others, Katz [117] and Nissanke [160], argue that Howard's model suffers from misspecification. Katz's only significant criticism is that there was a structural change in the economy, when Brezhnev came to power, which Howard ignores. This may be true but is a minor point easily corrected. Nissanke is more critical of Howard's model, primarily with respect to econometric practices and the limited number of observations. However, she uses Howard's basic specification in an unpublished paper on the Polish economy for which no conclusive results with respect to the existence of disequilibria can be drawn. Unfortunately, Nissanke fails to recognize the possibility of flexible prices for goods other than agricultural products and we cannot offer any comparison between her results and the
predicted signs of the model developed above. Further, all
three ignore the foreign sector and the potential impact
of trade on excess demands. This is obviously a deficiency
in Nissanke's work, and less important for the Soviet case
which Katz and Howard address.

In a reply to Katz and Nissanke, Howard [108] concludes
and I agree, that the bulk of their criticisms are unfounded.
His results for the Soviet case are robust with respect to
estimation techniques and the Barro-Grossman model does offer
strong evidence for the existence of excess demand. For the
East European case it is clear that further research is
needed. The model presented above offers a strong theoreti-
cal foundation for the hypothetical MOPE which was lacking,
and offers a theoretical explanation for previous ad hocery.
The limiting factor is data availability and this, along with
the neglect of the foreign sector, is unfortunately the
primary reason for Nissanke's ambiguous results.

In an alternative framework, Portes and Winter [175]
specify an aggregate demand and supply system and use a maxi-
mum likelihood technique developed by Quandt [183] to sort
data into two alternative regimes and estimate the supply
and demand for consumer goods in each of four countries:
Hungary, Czechoslovakia, Poland and the German Democratic
Republic. They find that the excess demand regime is
dominant only in the German Democratic Republic whereas in
the other three the excess supply regime is dominant. Their
work, however, differs from Howard's and the model
developed in Chapters 4 through 6 above, in that they are testing for excess aggregate demand for goods, which Portes and Winter define as repressed inflation. Howard [107] has shown (as outlined in Appendix p) that excess demand for only one good in the consumer goods market is enough to generate the effective labor supply, money demand and consumer good demand function as described in Chapters 5 and 6 above. Further it is not clear that their method actually tests for repressed inflation as they define it.  

As Portes and Winter note, they cannot draw strong, unambiguous empirical conclusions [because] the sample sizes are small; [they] have no additional information to help in sample separation; . . . the supply equation is not derived from . . . rational planners' behavior and there are major unsolved problems in the theory of hypothesis testing for disequilibrium models. (?)

The empirical analysis of the disequilibrium characteristics of the Soviet and East European economies deserves more attention.

Each of the studies above is concerned with aggregate output and is not disaggregated, as is the hypothetical MCPE model developed here. Further, each of the above papers takes the total level of output, the capital stock and the amount of consumer goods in the constrained market as exogenous policy variables. That is, the central planners determine the levels of output, etc., as policy variables which are always achieved. This is not the case in the hypothetical MCPE as we have described it above, and in our
model these variables are endogenous. Rather than assume that these variables are exogenous we have assumed that households and enterprises, when constrained, expect to be constrained in the future period and base their decisions on the expected and actual constraints encountered. (They do expect to be unconstrained in some future period, though). As a result we shall use the previous period value of \( c_A, k_A, l_A \) and \( l_B \); designated as \( \overline{c}_A, \overline{k}_A, \overline{l}_A \), and \( \overline{l}_B \), indicating that the current period's consumption and production decisions are made on the basis of constraints which are expected to prevail in the current period.

In order to test the model developed above, assuming the relevant data are available, a first attempt at estimation would be to consider a linear form of the model. The model is presented in Appendix H and is specified as an interdependent system. Since the relative price ratios appear in every equation, it is not possible to block diagonalize the endogenous coefficients. As a result the model may be classified as a non-recursive causal circle. (8)

Although it is argued that recursive and simultaneous systems are observationally equivalent, as a practical matter the recursive system is particularly useful since identification, estimation, and statistical hypothesis testing are facilitated. L'Esperance [131] notes that an operational notion of causality applicable to interdependent systems is quite useful. This is because the structure
of the coefficient matrix may be established and then the equations of the model may be more easily identified and estimated in a block recursive format. However, this also necessitates the assumption that the variance-covariance matrix is block diagonal. In our model this may not be the case due to the potential influence of central planners in all sectors. The system as specified in Appendix H consists of twelve equations to be estimated all of which are over identified by the order condition, a necessary but not sufficient condition.\(^{(g)}\) Thus, we may use an estimation technique such as three stage least squares to estimate the equations of the model and test the hypotheses (or significance of the estimated coefficients) regarding each of the variables in each equation as developed in Chapters 4 through 6.

7.4 Extensions and Future Research

There are several important issues concerning the hypothetical MCPE which may be addressed using the model developed above. These issues deal with both theoretical and empirical questions, and range from microeconomic problems to macroeconomic and aggregate adjustment problems. Several issues arise on both the microeconomic and macroeconomic levels, e.g. the nature of disequilibrium in the MCPE.

Within the enterprise sector there are many extensions which should be considered. For example, a more
sophisticated treatment of the enterprise objective function may provide further insight to the problem of microeconomic efficiency and resource allocation. Recall in Chapter 4 that bonuses were specified as a function of value added, determined in part by the coefficient β, a planner's control variable. This may be extended to consider the nature of β, how central planners determine its value, and so forth. By providing a more elaborate bonus specification we may gain further insight into such problems as overutilizing labor, and "storming," the cyclical patterns which arise in the production process. A second interesting question, with respect to enterprise behavior, is whether or not there is a "wealth" effect for enterprises. The role of enterprise deposits should be considered in more depth. We assumed in Chapter 4 that enterprises accumulate deposits, and have a demand for these deposits, but that the actual level of deposits the enterprise holds does not affect its demand for factor inputs. Does the stock of enterprise deposits, E, have an impact upon enterprise factor demand and if so what is the impact and what is the central planners' response to it?

With respect to households, further treatment of the role of public goods and the tax system is necessary. Taxes on households were made a function of income and the supply of public goods in Chapter 4, but later taxes were considered as exogenous. Completely endogenizing taxes
may yield further insight to the adjustment process at the macroeconomic level. To what extent may taxes be a built-in stabilizer as they often are in the market type economy? Further, how do central planners determine the level of taxes, tax rates, and the types of taxes to be instituted? (A similar problem arises with respect to enterprise subsidies. To what degree are subsidies determined a priori, or are they determined ex post to ensure some minimum level of profits?)

Further microeconomic problems to be investigated deal with the role of the FTO. For example, the incentive structure of the FTO may be elaborated when the FTO plays an active (but perhaps minor) role in the economy rather than a passive role as assumed in Chapter 6. Then, to what extent does an active FTO play an important role in the import-export decision making process? Further, what impact will $I^S$, the potential supply of enterprise deposits, have upon the domestic money supply? Will the domestic economy continue to be insulated from foreign disturbances to the degree outlined above?

Further macroeconomic issues which arise are numerous. One major issue, the trade-off between price stability (which may give rise to disequilibrium) and income redistribution (which changing prices would imply), needs to be explored further. For example, to what degree will income redistribution, as a result of price changes to achieve
microeconomic efficiency and rational resource allocation, be tolerated? The disequilibrium aspects should be elaborated further as well. To what degree is disequilibrium tolerated, perhaps accepted, and do planners explicitly consider disequilibrium in the planning process and are they aware of its dysfunctional effects? Further consideration must also be given to the alternative instruments at the disposal of central planners which may be used to achieve both internal and external balance. We considered $\alpha$, the weight on value added in the enterprise objective function, $g_{net}$, net government expenditures, and foreign trade controls explicitly in Chapter 6. In addition to these instruments are direct controls over prices and the exchange rate. These may also be adjusted to help achieve both internal and external balance. Further, the impact of taxes, subsidies, and $\alpha$, differentiated by sector should also be considered. What are the production and substitution effects associated with differentiated control variables and what are the long-term implications with respect to economic growth and development?

All of the above questions are closely associated with determining the behavior of planners. The decisions planners make and the rationale for these decisions must be examined further. What is the basis for planners' behavior and what influences planners? Are there implicit markets
operating in the centrally planned economy which we could examine to gain insight into the planning process?

The above issues may be addressed on both the theoretical and empirical levels. It is clear that the empirical counterpart of all of the above questions must be examined in an attempt to obtain a definitive answer to the questions posed. The empirical problems which must be addressed in the future deal with problems such as data collection and evaluation, problems which in the case of the centrally planned economies of the Soviet Union and Eastern Europe are substantial. The problems deal with translation, data collection, consistency of time series and cross section data definitions (due in part to economic reforms), and actual estimation and testing of alternative econometric specifications which incorporate disequilibrium aspects.

The model developed above provides a consistent framework which may be used to address these questions. Further disaggregation and the introduction of more sophisticated treatment of the behavior of the actors within the MCEP will be the next task of this researcher. In particular, the microeconomic behavior of the enterprise and the role of central planners' control over enterprise deposits is being explored in more detail. The model will then be reaggregated to examine the macroeconomic implications. Further insight into the macroeconomic adjustment
process may be gained through examination of these monetary aspects of central planners' and enterprise behavior.
Notes to Chapter 7

(1) Tardos notes that this is true for the Hungarian case. It appears to be the case in Poland as well. See Zielinski [243].

(2) See Fallenbuchl, et al. [67].

(3) See Fallenbuchl [64].

(4) See Marczewski [148], Mieczkowski [152], Czerwinski [48] and Zielinski [243].

(5) Nuti [162] currently estimates that value added and profits have a relative importance of ten to one.

(6) The maximum likelihood technique developed by Quandt [183] tests for the existence of equilibrium in a single market and is not applicable to the aggregated case Portes and Winter [175] examine. They note there is very likely excess demand for particular goods at the same time there is excess supply of other goods. It is the existence of the excess demands for one or more consumer good which generates the labor supply disincentives. These effects will occur regardless of whether or not there is also a corresponding excess supply of (unwanted) consumer goods which results in a zero net excess demand for consumer goods as Portes and Winter indicate may be the case.
(7) Portes and Winter [175], p. 35.


BIBLIOGRAPHY


[52] Dochod Narodowy, Gliwnego Urzdu Statystycznego, Warsaw, Poland.


APPENDIX A
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a) As of December 31 of each year, except for 1960 which is as of January 1, 1961.

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Source: Calculated from Rocznik Statystyczny

(a) Used to convert total output (GNP) and Gross Fixed Capital (Productive) to 1971 prices to compute tables 1.3 and 1.6
### TABLE 16: Data for computing Table 1.4, Price Indices: $1961 = 100$, $1965 = 100$, $1971 = 100$

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### TABLE 17: Price Index for Adjusting Fixed Capital to Current Prices for 1960-1969

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a) In slates of output per sly of green fixed capital.

b) In thousands of slates of green fixed capital per worker.

c) Real Gross Material Product.
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| Industry |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Rate of Growth of Output (b) | 11.7 | 3.6  | 5.6  | 10.2 | 9.5  | 7.7  | 4.7  | 9.4  | 8.5  | 11.4 | 7.3  | 9.2  | 11.6 | 12.3 | 11.4 |
| Rate of Growth of Labor (Total) | 2.3  | 8.0  | 2.2  | 1.8  | 0.3  | 3.7  | 3.3  | 3.3  | 5.2  | 5.2  | 4.3  | 4.3  | 2.9  | 2.4  | 1.5  |
| Rate of Growth of Labor (Socialist Sector) | 2.7  | 6.7  | 2.5  | 1.9  | 4.4  | 1.6  | 4.2  | 2.5  | 1.6  | 1.4  | 3.1  | 4.0  | 2.8  | 2.4  | 1.5  |
| Output-Labor Ratio | 15  | 58  | 41  | 61  | 68  | 71  | 75  | 76  | 81  | 89  | 99  | 108 | 118 | 119 | 129 |
| Rate of Growth of Output-Labor Ratio | 9.2  | 6.4  | 3.7  | 2.2  | 3.0  | 3.3  | 2.5  | 3.5  | 4.8  | 7.2  | 6.8  | 5.0  | 8.4  | 9.4  | 9.7  |

| Construction |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Rate of Growth of Output (c) | 3.6  | 5.3  | 4.4  | 8.7  | 7.5  | 8.9  | 5.8  | 4.4  | 6.6  | 4.8  | 4.8  | 21.4 | 16.3 | 13.8 | 11.0 |
| Rate of Growth of Labor (Total) | 1.2  | 4.9  | 5.5  | -4.3 | 3.9  | 3.6  | 6.4  | 4.7  | 4.0  | -0.6 | 4.3  | 6.6  | 10.1 | 9.1  | 3.0  |
| Rate of Growth of Labor (Socialist Sector) | 1.0  | 6.3  | 4.6  | -4.3 | 3.9  | 2.7  | 5.6  | 4.2  | 4.0  | -0.3 | 5.0  | 6.6  | 10.1 | 6.8  | 3.0  |
| Output-Labor Ratio | 55  | 56  | 56  | 65  | 68  | 69  | 73  | 76  | 78  | 84  | 86  | 96  | 101 | 108 | 116 |
| Rate of Growth of Output-Labor Ratio | 2.4  | 0.4  | -1.0 | 13.9 | 3.5  | 5.2  | 5.0  | 4.5  | 2.3  | 7.4  | 0.8  | 14.1 | 5.6  | 6.4  | 3.7  |

| Agriculture |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Rate of Growth of Output (d) | 13.1 | -16.1 | 10.6 | 1.1  | 3.8  | 4.7  | 3.6  | 3.5  | -50.3 | 15.2 | 8.2  | 5.5  | 3.4  | 2.9  | -8.1 |
| Rate of Growth of Labor (Total) | -0.3 | -0.3 | -0.3 | 0.9  | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | -0.3 | 0.5  | 0.5  | 0.1  |
| Rate of Growth of Labor (Socialist Sector only) | 7.2  | 3.9  | 2.6  | 4.4  | 8.1  | 4.5  | 3.7  | 6.1  | 7.7  | 2.7  | 2.4  | 2.7  | 2.6  | 4.3  | 3.2  |
| Output-Labor Ratio | 22  | 25  | 26  | 26  | 25  | 26  | 27  | 27  | 23  | 26  | 28  | 30  | 31  | 30  | 27  |
| Rate of Growth of Output-Labor Ratio | 13.4 | -15.6 | 11.0 | 11.6 | 4.1  | 5.1  | 4.1  | 3.9  | -20.2 | 15.5 | 8.5  | 5.7  | 3.7  | -2.4 | -8.2 |

| Transportation and Communication |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Rate of Growth of Output (e) | 8.1  | 11.2 | 3.8  | 4.9  | 9.6  | 8.6  | 5.4  | 8.2  | 6.7  | 8.5  | 11.8 | 12.5 | 9.0  | 18.0 | 13.8 |
| Rate of Growth of Labor (Total) | 1.5  | 2.7  | 8.8  | 1.7  | 3.9  | 6.0  | 2.1  | 2.9  | 3.6  | 2.4  | 2.9  | 3.2  | 0.9  | 2.9  | 1.9  |
| Rate of Growth of Labor (Socialist Sector only) | 2.3  | 7.8  | 8.8  | 1.7  | 3.1  | 6.1  | 2.1  | 2.9  | 3.6  | 2.4  | 2.9  | 3.3  | 0.9  | 2.9  | 1.9  |
| Output-Labor Ratio | 18  | 61  | 64  | 62  | 44  | 57  | 49  | 51  | 52  | 53  | 59  | 60  | 70  | 79  | 88  |
| Rate of Growth of Output-Labor Ratio | 6.5  | 8.3  | -4.6 | 3.2  | 5.6  | 2.2  | 5.3  | 5.1  | 1.0  | 5.9  | 8.7  | 9.0  | 8.0  | 12.7 | 11.7  |

(a) In hundreds of shihin of output per worker
(b) Real Gross Material Product
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| TABLE 22: continued |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|----------------|-------|-------|-------|-------|-------|-------|-------|
| Total            | 279.6 | 325.6 | 376.5 | 462.6 | 537.3 | 501.6 | 663.2 |
| Industry         | 129.1 | 150.9 | 179.9 | 186.8 | 212.9 | 253.6 | 276.3 |
| Construction     | 55.6  | 60.3  | 61.5  | 69.5  | 78.5  | 28.5  | 38.8  |
| Agriculture      | 12.3  | 20.0  | 23.0  | 27.6  | 31.3  | 45.3  | 51.0  |
| Forestry         | 3.8   | 4.1   | 4.3   | 5.1   | 5.5   | 6.4   | 7.0   |
| Transportation & Communication | 27.9  | 30.6  | 35.2  | 41.2  | 46.8  | 55.0  | 58.4  |
| Trade            | 21.2  | 22.7  | 27.1  | 33.8  | 40.0  | 43.8  | 47.9  |
| Interest         | 20.4  | 22.9  | 26.1  | 32.6  | 38.6  |       |       |
| External         | 0.4   | 0.8   | 1.0   | 1.2   | 1.6   |       |       |
| State & Communal Housing | 10.2  | 11.4  | 12.9  | 15.6  | 18.3  | 15.0  | 16.6  |
| Education, Science & Culture | 22.6  | 26.8  | 30.9  | 34.0  | 35.1  | 42.2  | 45.7  |
| Health, Social Services | 12.3  | 13.6  | 17.1  | 19.9  | 22.1  | 25.1  | 29.2  |
| Financial & Insurance Institutions | 2.2   | 2.4   | 2.8   | 3.2   | 3.5   | 4.3   | 4.6   |
| Administration of Public Institutions | 5.7   | 6.1   | 7.3   | 8.3   | 8.5   | 10.4  | 11.1  |

### TABLE 23: Factor Productivity in the Polish Economy

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⁵Hundreds of zlotys of output per worker.

⁶Zlotys of output per zloty of net fixed capital.

⁷Assumes constant returns to scale.
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<td><strong>Earnings in the Socialized Economy (a)</strong></td>
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<td><strong>Earnings in the Non-Socialist Sector</strong> (excluding agriculture)</td>
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<td>Rate of Growth of Total Payments to Labor</td>
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<tr>
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<td>Net Wage Fund (b)</td>
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(a) 1960 estimated  
Source: Calculated from: Rocznik Statystyczny 1976 table I p.xxvii, table 152, 1971  
table 846, 847, 1978 table 129.
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(a) Estimated socialist amortization in current prices equals the same percent of total amortization as socialist gross fixed capital in constant prices is of total gross fixed capital.

Source: Calculated from Rocznik Statystyczny 1976 table 1, pp xxxiii, xxxiv and table II, III, IV of appendix 1.
Table 26
Commodity Composition of Polish Trade (S.I.T.C. Classification)

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<tr>
<td>Raw materials (excluding raw materials for food):</td>
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Table 26 (continued)

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From Fallenbucchi [359]
APPENDIX B

Derivation of the Signs of the Partial Derivatives for the Households' Labor Supply, Money Demand, and Consumer Goods Demand Functions
To derive the households' response to exogenous changes in the provision of government services, $g_p$, the real wage, $w_p$, and wealth, $\Omega$, consider a one period case. The constrained objective function to be maximized is:

\[(244) \quad u_1 = u(c^d, l^s, g_p) + \lambda \left( \frac{m}{p} + b \frac{w_i^s}{p} - T \frac{w_i^s}{p}, g_p \right) + \frac{w_i^s}{p} - c^d\]

If we let subscripts denote the partial derivatives of each function and we suppress the superscripts on $c$ and $l$, the first order conditions for utility maximization are:

\[(245) \quad \frac{\partial u_1}{\partial c} = u_c - \lambda = 0\]

\[(246) \quad \frac{\partial u_1}{\partial l} = u_l + \lambda \frac{w_i}{p} \left( b \frac{w_i^s}{p} - T \frac{w_i^s}{p} + 1 \right) = 0\]

\[(247) \quad \frac{\partial u_1}{\partial g_p} = \frac{m}{p} + b \left( \frac{w_i}{p} \cdot l \right) - T \left( \frac{w_i^s}{p}, g_p \right) + \frac{w_i^s}{p} - c = 0\]

We assume that $g_p$, the provision of government services, is set exogenously by the central planners. Consumers can not directly influence the amount of "public goods" that are provided to them. However, we may find the effect of an exogenous change in $g_p$ upon $c^d$ and $l^s$ by differentiating (245)-(247) with respect to $g_p$. Let us assume also that $\frac{\partial w_i}{\partial g_p} = \frac{\partial \Omega}{\partial g_p} = 0$. We get

\[(248) \quad uc_c \frac{\partial c}{\partial g_p} + uc_l \frac{\partial l}{\partial g_p} - \frac{\partial \lambda}{\partial g_p} = 0\]
\begin{align}
(249) \quad & u_l \left[ \frac{\partial c}{\partial g_p} \right] + u_{ll} + \lambda \left( \frac{w}{p} \right)^2 \left[ \frac{b_{w_l, w_l}}{p} - \frac{w_l}{p} \right] \frac{\partial l}{\partial \lambda} \\
& + u_{lg_p} + \frac{w}{p} \left( b \frac{w_l}{p} - \frac{T_{w_l}}{p} + 1 \right) \frac{\partial \lambda}{\partial g_p} = \lambda \frac{w_T}{p} \frac{w_l}{p}, \frac{w_l}{p}, \frac{g_p}{p} \\
\end{align}

\begin{align}
(250) \quad & -1 \frac{\partial c}{\partial g_p} + \frac{w}{p} \left( b \frac{w_l}{p} - \frac{T_{w_l}}{p} + 1 \right) \frac{\partial l}{\partial \lambda} + 0 = T_g p \\
\end{align}

Now, if we assume that consumption, work and government services all have an independent influence on utility, for simplicity, the cross partials of $U$ become zero and (248)-(250) may be written as:

\begin{align}
(251) \quad & \begin{bmatrix}
0 \\
0 \\
-1 \\
-1 \\
\end{bmatrix}
= \begin{bmatrix}
0 \\
0 \\
\frac{\partial c}{\partial g_p} \\
\frac{\partial \lambda}{\partial g_p} \\
\end{bmatrix}

\begin{bmatrix}
0 \\
\frac{w_T}{p} \frac{w_l}{p}, \frac{g_p}{p} \\
\frac{T_{w_l}}{p} \frac{g_p}{p} \\
\end{bmatrix}
\end{align}
From this expression we can solve for \( \frac{\partial c}{\partial e_p} \) and \( \frac{\partial \pi}{\partial e_p} \) using Cramer's rule. Denote the matrix on the left hand side by \( D_1 \).

Then \( |D_1| > 0 \) for \( u \) to be a maximum. We then have:

\[
(252)
\]

\[
\frac{\partial c}{\partial e_p} = \frac{1}{|D_1|} \begin{vmatrix}
0 & 0 & -1 \\
\lambda \frac{w}{p} w_{l'}, e_p & [u_{ll'} + \lambda A_2] \frac{w}{p} A_1 \\
\frac{w}{p} A_1 & 0 \\
\end{vmatrix}
\]

\[
\frac{\partial c}{\partial e_p} = \frac{1}{|D_1|} \begin{vmatrix}
-\lambda (\frac{w}{p})^2 \frac{w}{p} w_{l'}, e_p - \frac{w}{p} A_1 - \frac{w}{p} A_1 & [u_{ll'} + (\frac{w}{p})^2 A_2] \\
\end{vmatrix}
\]

We shall assume that \( A_1 = (b \frac{w_{l'}}{p} - \frac{w_{l'}}{p} + 1) \) is positive since it is unlikely that the marginal tax would ever be greater than marginal income including bonuses. Also if there is a progressive tax scheme, the marginal tax rate increases with income \( (\frac{w}{p} w_{l'}, e_p > 0) \), and a regressive bonus scheme, the marginal bonus rate decreases with income \( (b \frac{w}{p} w_{l'}, e_p < 0) \), then \( A_2 = \frac{b}{p} \frac{w_{l'}}{p} \frac{w_{l'}}{p} - \frac{w_{l'}}{p} \) is negative. If bonuses and taxes are exogenous, in the sense that the bonus and tax rates are independent of the level of income, \( A_2 \) is zero. Let us
call \( A_1 \) the "net marginal earnings rate" and \( A_2 \) the "net rate of progressivity." Thus we find that:

\[
\frac{\partial c}{\partial \varepsilon_p} > 0 \text{ as }
\]

\[
\left| u_{\varepsilon \varepsilon} + \lambda \left( \frac{w}{p} \right)^2 A_2 \right| > -\lambda \left( \frac{w}{p} \right)^2 A_1
\]

Further, if \( A_2 = 0 \) then

\[
\frac{\partial c}{\partial \varepsilon_p} > 0 \text{ if } \left| u_{\varepsilon \varepsilon} \right| > -\lambda \left( \frac{w}{p} \right)^2 A_1.
\]

Similarly:

\[
\left( 254 \right) \quad \frac{\partial \varepsilon}{\partial \varepsilon_p} = \frac{1}{|D_1|} \begin{vmatrix}
  u_{cc} & 0 & -1 \\
  0 & \lambda \frac{w}{p} \frac{w}{p}, & \frac{w}{p}(A_1) \\
  -1 & T_{\varepsilon_p} & 0
\end{vmatrix}
\]

\[
= \frac{1}{|D_1|} \begin{bmatrix}
  -u_{cc} \cdot T_{\varepsilon_p} \frac{w}{p} A_1 + \lambda \frac{w}{p} \frac{w}{p}, & \frac{w}{p}(A_1)
\end{bmatrix}
\]

And we have:

\[
\left( 255 \right) \quad \frac{\partial \varepsilon}{\partial \varepsilon_p} > 0
\]

Now to determine the signs of \( \frac{\partial c}{\partial \frac{w}{p}}, \frac{\partial \varepsilon}{\partial \frac{w}{p}} \) differentiate

\[
\left( 245 \right)-\left( 247 \right) \text{ with respect to } \frac{w}{p} \text{ assuming } \frac{\partial \varepsilon}{\partial \frac{w}{p}} = \frac{\partial \varepsilon_p}{\partial \frac{w}{p}} = 0.
\]

We get:

\[
\left( 256 \right) \quad U_{cc} \frac{\partial c}{\partial \frac{w}{p}} + U_{cc} \frac{\partial \varepsilon}{\partial \frac{w}{p}} - \frac{\partial \varepsilon}{\partial \frac{w}{p}} = 0
\]
(257) \[ u_{\ell} \left( \frac{\partial c}{\partial w_p} \right) \mid + \left[ u_{\ell \ell} + \lambda \left( \frac{w}{p} \right)^2 \left( \frac{b_{w \ell} w}{p^2} - \frac{T_{w \ell}}{p} \right) \right] \cdot \frac{\partial \lambda}{\partial w_p} \]

\[ + \frac{w}{p} \left( \frac{b_{w \ell}}{p} - \frac{T_{w \ell} + 1}{p} \right) \frac{\partial \lambda}{\partial w_p} = -\lambda \left[ \left( \frac{w}{p} - \frac{T_{w \ell}}{p} \right) \right] \]

\[ \lambda \left( \frac{b_{w \ell} w}{p} - \frac{T_{w \ell}}{p} \right) \]

(258) \(-1\frac{\partial c}{\partial w_p} + \frac{w}{p} \left( \frac{b_{w \ell}}{p} - \frac{T_{w \ell} + 1}{p} \right) \frac{\partial \lambda}{\partial w_p} = -\lambda \left( \frac{b_{w \ell} w}{p} - \frac{T_{w \ell}}{p} \right) \]

Again assuming the cross partials are zero for simplicity, equations (256)-(258) can be rewritten as:

(259) \[
\begin{bmatrix}
    u_{cc} & 0 & -1 \\
    0 & u_{\ell \ell} + \lambda \left( \frac{w}{p} \right)^2 A_2 & \frac{w \lambda}{p A_1} \\
    -1 & \frac{w}{p} A_1 & 0
\end{bmatrix}
\begin{bmatrix}
    \frac{\partial c}{\partial w_p} \\
    \frac{\partial \lambda}{\partial w_p}
\end{bmatrix}
= \begin{bmatrix}
    0 \\
    -\lambda [A_1 + \lambda A_2] \\
    -\lambda A_2
\end{bmatrix}
\]

Denote the matrix on the left hand side by \( D_2, |D_2| > 0 \), and apply Cramer's rule to get:
\[ \frac{\partial c}{\partial w_p} = \frac{1}{|D_2|} \cdot \begin{bmatrix} 0 & 0 & -1 \\ -[A_1 + \lambda A_2] & u_{\lambda \lambda} + \lambda(\frac{w}{p})^2 A_2 & \frac{w}{p} A_1 \\ -A_2 & \frac{w}{p} A_1 & 0 \end{bmatrix} \]

\[ = \frac{1}{|D_2|} \cdot ( -1) \left[ -\lambda(A_1 + \lambda A_2)(\frac{w}{p})^2 A_1 + \lambda A_2(u_{\lambda \lambda} + \lambda(\frac{w}{p})^2 A_2) \right] \]

Thus \[ \frac{\partial c}{\partial w_p} > 0 \] if

\[ -\lambda[A_1 + \lambda A_2] > \lambda A_2[u_{\lambda \lambda} + \lambda(\frac{w}{p})^2 A_2] \]

and:

\[ [A_1 + \lambda A_2] > 0 \]

Note also if \[ A_2 = 0 \] then \[ \frac{\partial c}{\partial w_p} > 0 \]

Similarly:

\[ \frac{\partial \lambda}{\partial w_p} = \frac{1}{|D_2|} \cdot \begin{bmatrix} u_{cc} & 0 & -1 \\ 0 & -\lambda[A_1 + \lambda A_2] & \frac{w}{p} A_1 \\ -1 & -\lambda[A_2] & 0 \end{bmatrix} \]

\[ = \frac{1}{|D_2|} \cdot \left[ u_{cc}(\frac{w}{p} A_1 A_2) + \lambda(A_1 + \lambda A_2) \right] \]

Thus \[ \frac{\partial \lambda}{\partial w_p} \leq 0 \] as:

\[ u_{cc}(\frac{w}{p}) A_1 A_2 \leq \lambda(A_1 + \lambda A_2) \]
if (262) does not hold. If (262) holds or \( A_2 = 0 \) then
\[
\frac{\partial \lambda}{\partial p} > 0.
\]
Now to find the signs of \( \frac{\partial c}{\partial \Omega} \) and \( \frac{\partial \lambda}{\partial \Omega} \) differentiate (245)-(247) with respect to \( \Omega \), now assuming \( \frac{\partial p}{\partial \Omega}, \frac{\partial g_2}{\partial \Omega} = 0 \). We get
\[
(265) \quad u_{cc} \frac{\partial c}{\partial \Omega} + u_{c \lambda} \frac{\partial \lambda}{\partial \Omega} - \frac{\partial \lambda}{\partial \Omega} = 0
\]
\[
(266) \quad u_{c \lambda} \frac{\partial c}{\partial \Omega} + (u_{\lambda \lambda} + \lambda (\frac{w}{p})^2 A_2) \frac{\partial \lambda}{\partial \Omega} + \frac{w}{p} A_2 \frac{\partial \lambda}{\partial \Omega} = 0
\]
\[
(267) \quad (-1) \frac{\partial c}{\partial \Omega} + A_W \frac{\partial \lambda}{\partial \Omega} = -1
\]
Assuming the cross partials of \( U \) are zero, for simplicity, equations (265)-(267) can be rewritten as:
\[
(268) \quad \begin{bmatrix}
    u_{cc} & 0 & -1 \\
    0 & [u_{\lambda \lambda} + \lambda (\frac{w}{p})^2 A_2] & \frac{w}{p} A_2 \\
    -1 & \frac{w}{p} A_2 & 0
\end{bmatrix} \begin{bmatrix}
    \frac{\partial c}{\partial \Omega} \\
    \frac{\partial \lambda}{\partial \Omega}
\end{bmatrix} = \begin{bmatrix}
    0 \\
    0
\end{bmatrix}
\]
Denoting the matrix on the left hand side by \( D_3, |D_3| > 0 \),
we have by Cramer's rule:
\[
(269) \quad \frac{\partial c}{\partial \Omega} = \frac{1}{|D_3|} \begin{vmatrix}
    0 & 0 & -1 \\
    0 & [u_{\lambda \lambda} + \lambda (\frac{w}{p})^2 A_2] & \frac{w}{p} A_2 \\
    -1 & \frac{w}{p} A_2 & 0
\end{vmatrix} = \frac{1}{|D_3|} (-1) (u_{\lambda \lambda} + (\frac{w}{p})^2 A_2)
\]
\[\frac{\partial c}{\partial \Omega} > 0\]
And

\[
\frac{\partial \pi}{\partial \Omega} = \frac{1}{|D_3|} \begin{vmatrix}
  u_{cc} & 0 & -1 \\
  0 & 0 & \frac{w_A}{p} \\
  -1 & -1 & 0 \\
\end{vmatrix}
\]

\[
= \frac{1}{|D_3|} [u_{cc} w_A]
\]

\[
\frac{\partial \pi}{\partial \Omega} < 0
\]

To derive the signs of the households' money demand function totally differentiate equation (14). First consider \(d\frac{w}{p} \neq 0\), and \(d\xi_p = d\Omega = 0\). Again suppressing the superscripts on \(c\) and \(l\) we have:

\[
\frac{\partial m_d}{d\frac{w}{p}} = (b \frac{w}{p} - T \frac{w}{p} + l) \left( \frac{w}{p} \frac{\partial l}{d\frac{w}{p}} + l \right) - \frac{\partial c}{d\frac{w}{p}}
\]

\[
= A_l \left( \frac{w}{p} \frac{\partial l}{d\frac{w}{p}} + l \right) - \frac{\partial c}{d\frac{w}{p}}
\]

And if the marginal propensity to consume is less than one, the increase in income is greater than the increase in consumption so that:

\[
A_l \left( \frac{w}{p} \frac{\partial l}{d\frac{w}{p}} + l \right) > \frac{\partial c}{d\frac{w}{p}}
\]

and thus

\[
\frac{\partial m_d}{d\frac{w}{p}} > 0.
\]

To find \(\frac{\partial m_d}{d\xi_p}\) differentiate equation (14) with respect
to \( g_p \) assuming \( \frac{\partial w}{\partial p} = \frac{\partial \Omega}{\partial p} = 0 \). We find that

\[
(274) \quad \frac{\partial m^d}{\partial \varepsilon_p} = \frac{w}{p} \frac{\partial l}{\partial \varepsilon_p} + b \frac{w}{p} \frac{\partial l}{\partial \varepsilon_p} - T \frac{w}{p} \frac{\partial l}{\partial \varepsilon_p} - \frac{\partial c}{\partial \varepsilon_p}
\]

\[= A_1 \frac{w}{p} \frac{\partial l}{\partial \varepsilon_p} - \frac{\partial c}{\partial \varepsilon_p} \]

(275) \( \frac{\partial m^d}{\partial \varepsilon_p} > 0 \) if \( \frac{\partial c}{\partial \varepsilon_p} < 0 \).

Otherwise: \( \frac{\partial m^d}{\partial \varepsilon_p} > 0 \) as \[A_1 \frac{w}{p} \frac{\partial l}{\partial \varepsilon_p} \geq \left| - \frac{\partial c}{\partial \varepsilon_p} \right| \).

Now for \( \frac{\partial m^d}{\partial \Omega} \), differentiate equation (14) assuming \( \partial \Omega \neq 0, \frac{\partial w}{\partial p}, \frac{\partial \varepsilon_p}{\partial p} = 0 \). We have

\[
(276) \quad \frac{\partial m^d}{\partial \Omega} = \frac{w}{p} \frac{\partial l}{\partial \Omega} + b \frac{w}{p} \frac{\partial l}{\partial \Omega} - T \frac{w}{p} \frac{\partial l}{\partial \Omega} - \frac{\partial c}{\partial \Omega}
\]

\[= A_1 \frac{w}{p} \frac{\partial l}{\partial \Omega} - \frac{\partial c}{\partial \Omega} < 0 \]
Table 27

Summary of Signs of Partial Derivatives for Households

\[ \frac{\partial c}{\partial g_p} > 0 \text{ if } \left| u_{\ell \ell} + \lambda (\frac{w}{p})^2 A_2 \right| > \left| \lambda (\frac{w}{p})^2 A_1 \right| \]

\[ \frac{\partial t}{\partial g_s} > 0 \]

\[ \frac{\partial c}{\partial w_p} > 0 \text{ if } \left| -\lambda [A_1 + \lambda A_2] \frac{w}{p} A_1 \right| > \left| \lambda A_2 [u_{\ell \ell} + \lambda (\frac{w}{p})^2 A_2] \right| \]

and if \([A_1 + \lambda A_2] > 0\).

\[ \frac{\partial t}{\partial w_p} > 0 \text{ if } \left| u_{cc} \frac{w}{p} A_1 A_2 \right| > \left| \lambda (A_1 + \lambda A_2) \right| \]

and if \([A_1 + \lambda A_2] > 0\)

\[ \frac{\partial c}{\partial \Omega} > 0, \frac{\partial t}{\partial \Omega} < 0 \]

\[ \frac{\partial m^d}{\partial w_p} > 0, \frac{\partial m^d}{\partial \Omega} < 0 \]

\[ \frac{\partial m^d}{\partial g_p} \asymp \left| \lambda_1 \frac{w}{p} \frac{\partial t}{\partial g_p} \right| \asymp \left| -\frac{\partial c}{\partial g_p} \right| \]

Note: \( A_2 = 0 \) is a sufficient condition for \( \frac{\partial c}{\partial w_p}, \frac{\partial t}{\partial w_p} > 0 \).
APPENDIX C

Derivation of Optimum Production Conditions and the
Signs of the Partials of the Supply and Demand
Functions for the Enterprise in a
Hypothetical MCPE
The hypothetical MCPE enterprise maximizes

\[(277) \quad F = \phi(l_t, k_t) - \frac{r}{p} k^d_t - (1 - \alpha)\frac{w^d_t}{p}.\]

Differentiating with respect to \(l\) and \(k\) we have:

\[(278) \quad \phi'_l - (1-\alpha)\frac{w}{p} = 0, \quad \text{and}\]

\[(279) \quad \phi'_k - \frac{r}{p} = 0.\]

We assume that \(\phi'_l, \phi'_k > 0, \phi'_{ll}, \phi'_{kk} < 0\) and \(\phi'_{lk} > 0\).

If the enterprise is constrained by the amount of enterprise deposits and the flow of deposits, the problem is one of constrained maximization. Let us consider a two period case. The objective function of the enterprise is then:

\[(280) \quad F = F_1 + F_2 = (y^S_1 - \frac{r}{p} k^d_1 - (1-\alpha)\frac{w^d_1}{p}) +
\]

\[+(y^S_2 - \frac{r}{p} k^d_2 - (1-\alpha)\frac{w^d_2}{p})\]

The enterprise takes wages and prices as given (either determined by the market or by central planners) and maximizes \(F\) subject to the constraint on deposits and production in each period. First, the stock of enterprise deposits and the incoming flow must be enough to cover expenditures in each period:

\[(281) \quad E_1 + y^S_1 - (1 + g(VA_0))\frac{w^d_1}{p} - \frac{r}{p} k_1 + \epsilon_1 \geq 0 \quad \text{and}\]

\[E_2 + y^S_2 - (1 + g(VA_1))\frac{w^d_2}{p} - \frac{r}{p} k_2 + \epsilon_2 \geq 0\]
(282) \[ E_2 + y_2^* - (1 + \beta(VA_1)) \frac{W}{P} k_2 - \frac{r}{p} k_2 + g_{s_2} \geq 0, \] where all variables are as defined in the text. These may be written as:

(283) \[ E_1 + y_1^* - (1 + \beta(VA_0)) \frac{W}{P} k_1 - \frac{r}{p} k_1 + g_{s_1} + \delta_1 = 0 \]

(284) \[ \delta_1 \geq 0 \]

(285) \[ E_2 + y_2^* - (1 + \beta(VA_1)) \frac{W}{P} k_2 - \frac{r}{p} k_2 + g_{s_2} + \delta_2 = 0 \]

(286) \[ \delta_2 \geq 0 \]

where \( \delta_1 \) and \( \delta_2 \) are slack variables. The equation describing the addition to enterprise deposits becomes:

(287) \[ e^d = y_1^* - (1 + \beta(VA_0)) \frac{W}{P} k_1 - \frac{r}{p} k_1 + g_{s_1} \]

We assume \( g_s \) is constant in each period and the production function may be written as:

(288) \[ y_1 = \phi(k_1, k_1) \]

(289) \[ y_2 = \phi(k_2, k_2) \]

and the signs of the partials are the same as mentioned above.

The enterprise manager now maximizes:
\[ L = [\phi(\ell_1, k_1) - \frac{\xi}{p}k_1 - (1 - \alpha)\frac{W}{p}k_1] + [\phi(\ell_2, k_2) - \frac{\xi}{p}k_2 - (1 - \alpha)\frac{W}{p}k_2] \\
\] 
\[ -\lambda_1[E_1 + \phi(\ell_1, k_1) - (1 + \beta(VA_0))\frac{W}{p}k_1 + \frac{\xi}{p}k_1 + \xi_s + \delta_1] \\
\] 
\[ -\lambda_2[E_2 + \phi(\ell_2, k_2) - (1 + \beta(VA_1))\frac{W}{p}k_2 + \frac{\xi}{p}k_2 + \xi_s + \delta_2] \\
\] 
\[ -\lambda_3[e_1 - \phi(\ell_1, k_1) + (1 + \beta(VA_0))\frac{W}{p}k_1 + \frac{\xi}{p}k_1 + \xi_s] \\
\]

Differentiating we have:

\[ \frac{\partial L}{\partial \ell_1} = \phi_{\ell_1} - (1 - \alpha)\frac{W}{p} - \lambda_1[\phi_{\ell_1} - (1 + \beta(VA_0))\frac{W}{p}] - \lambda_2[-\beta_{VA_1}\phi_{\ell_1} + \frac{W}{p}] \\
\] 
\[ -\lambda_3[-\phi_{\ell_1} + (1 + \beta(VA_0))\frac{W}{p}] = 0 \\
\]

\[ [1 - \lambda_1 + \lambda_3]\phi_{\ell_1} + [-(1 - \alpha) + \lambda_1(1 + \beta(VA_0))] + \lambda_2(\beta_{VA_1}\phi_{\ell_1} + \frac{W}{p}) \\
\] 
\[ -\lambda_3(1 + \beta(VA_0))\frac{W}{p} = 0 \\
\]

\[ (291) \quad [1 - \lambda_1 + \lambda_3]\phi_{\ell_1} + [-(1 - \alpha) + (\lambda_1 - \lambda_3) \cdot (1 + \beta(VA_0))] + \lambda_2(\beta_{VA_1}\phi_{\ell_1} + \lambda_2\frac{W}{p}] = 0, \text{ and} \\
\]

\[ \frac{\partial L}{\partial \ell_1} = \phi_{\ell_1} - \frac{\xi}{p} - \lambda_1[\phi_{\ell_1} - \frac{\xi}{p}] - \lambda_2[-\beta_{VA_1}\phi_{\ell_1} + \beta_{VA_1}\frac{\xi}{p}] \\
\] 
\[ -\lambda_3[-\phi_{\ell_1} + \frac{\xi}{p}] = 0 \\
\]

\[ (292) \quad [1 - \lambda_1 + \lambda_2(\beta_{VA_1} + \lambda_3)]\phi_{\ell_1} - [1 - \lambda_1 + \lambda_2(\beta_{VA_1} + \lambda_3)]\frac{\xi}{p} = 0 \\
\]

\[ (293) \quad \frac{\partial L}{\partial \ell_2} = \phi_{\ell_2} - (1 - \alpha)\frac{W}{p} - \lambda_2\phi_{\ell_2} + \lambda_2[1 + \beta(VA_1)]\frac{W}{p} = 0 \\
\]
\begin{align*}
(294) \quad \frac{\partial L}{\partial k_2^*} &= \phi_{k_2} - \frac{r}{p} - \lambda_2 \phi_{k_2} + \lambda_2 \frac{r}{2p} = 0 \\
(295) \quad \frac{\partial L}{\partial \lambda_1} &= E_1 + y_1^s - (1+\beta(VA_o)) \lambda_{1p}^w - \frac{r}{p} k_1 + e_s - \delta_1 = 0 \\
(296) \quad \frac{\partial L}{\partial \lambda_2} &= E_2 + y_2^s - (1+\beta(VA_o)) \lambda_{2p}^w - \frac{r}{p} k_2 + e_s - \delta_2 = 0 \\
(297) \quad \frac{\partial L}{\partial \lambda_3} &= e_1 - y_1^s + (1+\beta(VA_o)) \lambda_{3p}^w + \frac{r}{p} k_1 + e_s = 0 \\
(298) \quad \frac{\partial L}{\partial \delta_1} &= \lambda_1 \leq 0 \\
(299) \quad \frac{\partial L}{\partial \delta_2} &= \lambda_2 \leq 0
\end{align*}

From equations (291) and (293) we have:

\begin{align*}
(300) \quad [1-(\lambda_1-\lambda_3)] \phi_{\lambda_1} &= [(1-a)-(\lambda_1-\lambda_3)(1+\beta(VA_o))] \\
&= -\lambda_2 \beta(VA_o) \phi_{\lambda_1} \lambda_2 \frac{w}{p}
\end{align*}

and

\begin{align*}
(301) \quad (1-\lambda_2) \phi_{\lambda_2} &= [(1-a)-\lambda_2(1+\beta(VA_o))] \frac{w}{p}.
\end{align*}

From equations (292) and (294) we have:

\begin{align*}
(302) \quad \phi_{k_1} &= \frac{r}{p} \\
\text{and}
(303) \quad \phi_{k_2} &= \frac{r}{p}
\end{align*}
From equation (300) the hypothetical MCPE enterprise will hire labor up to the point where the marginal product of labor is equal to its costs, if $\alpha = 0$, and all costs are taken into account. $\lambda_1$, $\lambda_2$, $\lambda_3$, are the shadow cost of the constraints on enterprise deposits in each period and the constraint of accumulating deposits as described in equations (281), (282), and (283). The total cost of labor is not simply the wage rate however. Each unit of labor receives the wage rate plus some share of profits as a bonus. The first term on the right hand side of (300) corresponds to the wage rate (and the distortion due to $\alpha$) the second term accounts for the effect of the wage payment and the additional bonuses paid out on the enterprise deposit constraint in the first period ($\lambda_1$) and on the accumulation of deposits between periods ($\lambda_3$). The third term is the effect of increased purchases of labor in the first period upon the budget constraint in the second period. This effect arises because workers in the first period increase value added by an amount $\phi L_1$. This in turn automatically increases the bonus coefficient by $B_{W_A L_1}$. The additional payments to labor in the second period, as a result of increased purchases of labor in the first period is equal to the wage rate ($w$) times the amount of labor in the second period ($L_2$), times the additional
increase in the bonus coefficient brought about by the additional labor in the first period \( \beta V_{A1} \phi \lambda \).

Equation (301) expresses the same condition but because there is no third period the constraint on the flow of deposits and the impact of current labor hired upon future bonuses is not explicit. The essential points are clear however. First, there is a distortion due to \( \alpha \) which causes the enterprise to over utilize labor (when compared to the profit maximizing firm). Second, there are costs due to the budget and flow of deposit constraints \( (\lambda_1, \lambda_2, \lambda_3) \). And third, the enterprise must take into account the increase in the bonus coefficient and the resulting increase in bonuses in the future \( (\beta V_{A1} \phi \lambda \cdot \lambda W) \) when hiring workers in the present.

Equations (302) and (303) can be interpreted in a similar manner. Hiring an additional unit of capital services does not increase value added (since output goes up by \( \phi_k \) and costs increase by \( \frac{r}{p} \), the changes in value added is \( \phi_k - \frac{r}{p} = 0 \)) and therefore does not increase future bonuses. Similarly, another unit of capital services increases output and revenue by the same amount it increases costs. Therefore there is no distortion associated with the costs of the budget constraints or flow of deposit constraints as a result of hiring capital services.
We can also derive labor and capital services demand functions of the following form

\[(304) \quad \lambda^d(t) = \lambda^d\left(\frac{w}{p}, \frac{r}{p}, e_s, \alpha\right)
\]  

\[\quad - - + \geq 0\]

\[(305) \quad k^d(t) = k^d\left(\frac{w}{p}, \frac{r}{p}, e_s, \alpha\right)
\]  

\[\quad - - + \geq 0\]

where the signs below the variables indicate the signs of the partial derivatives.

To verify these signs let us consider two cases: (1) enterprises which are not constrained, and (2) enterprises facing constraints on enterprise deposits. In each case consider only a one period model for simplicity. (19)

Unconstrained enterprises simply maximize (277). Suppressing the superscripts and subscripts for notational simplicity and differentiating with respect to \(\lambda\) and \(k\) we have:

\[(306) \quad \phi_\lambda - (1-\alpha)\frac{k}{p} = 0\]

\[(307) \quad \phi_k - \frac{r}{p} = 0\]

To determine the signs of \(\frac{\partial k}{\partial \alpha}, \frac{\partial k}{\partial w}, \frac{\partial k}{\partial e_s}, \frac{\partial k}{\partial r}, \frac{\partial k}{\partial \alpha}, \frac{\partial k}{\partial w}, \frac{\partial k}{\partial e_s}\)

\(\frac{\partial k}{\partial r}\) totally differentiate (306) and (307). We get
(308) $\phi_{kk} d\ell + \phi_{k\ell} dk + \phi_{\ell k} d\ell^s - (1-\alpha) d\frac{w}{p} + \frac{w}{p} da = 0$

(309) $\phi_{kk} d\ell + \phi_{k\ell} dk + \phi_{\ell k} d\ell^s - d\frac{r}{p} = 0$

Rewriting in matrix form we have:

$$
\begin{bmatrix}
\phi_{kk} & \phi_{k\ell} \\
\phi_{\ell k} & \phi_{\ell\ell}
\end{bmatrix}
\begin{bmatrix}
d\ell \\
dk
\end{bmatrix} =
\begin{bmatrix}
(1-\alpha) d\frac{w}{p} - \frac{w}{p} da - \phi_{\ell k} d\ell^s \\
d\frac{r}{p} - \phi_{kk} d\ell^s
\end{bmatrix}
$$

To determine the sign of $\frac{\partial \ell}{\partial \frac{w}{p}}$ and $\frac{\partial k}{\partial \frac{w}{p}}$, assume $d\ell^s = da = d\frac{r}{p} = 0$, and denote the matrix on the left hand side of (310) as $H$, apply Cramer's rule and divide by $d\frac{w}{p}$ to get:

(311) $\frac{\partial \ell}{\partial \frac{w}{p}} = \frac{1}{|H|} \phi_{kk}(1-\alpha)$

$\frac{\partial \ell}{\partial \frac{w}{p}} < 0$ since $|H| > 0$ and $0 \leq \alpha \leq 1$,

and

(312) $\frac{\partial k}{\partial \frac{w}{p}} = \frac{1}{|H|} (-\phi_{\ell k})(1-\alpha)$

$\frac{k}{\partial \frac{w}{p}} < 0$.

Similarly, for $\frac{\partial \ell}{\partial \frac{r}{p}}$ and $\frac{\partial k}{\partial \frac{r}{p}}$ we get:

(313) $\frac{\partial \ell}{\partial \frac{r}{p}} = \frac{1}{|H|} (-\phi_{k\ell})$

$\frac{\partial \ell}{\partial \frac{r}{p}} < 0$, 

and

(314) $\frac{\partial k}{\partial \frac{r}{p}} = \frac{1}{|H|} (-\phi_{\ell k})$

$\frac{\partial k}{\partial \frac{r}{p}} < 0$. 

and

\[
\frac{\partial k}{\partial r} = \frac{1}{|H|} \frac{\partial l}{\partial p} \phi_{kl}
\]

\[
\frac{\partial k}{\partial p} < 0.
\]

To determine the signs of \( \frac{\partial l}{\partial a} \) and \( \frac{\partial k}{\partial a} \) assume \( \frac{\partial r}{\partial p}, \frac{\partial w}{\partial p}, \frac{\partial g}{\partial p} = 0 \), apply Cramer's rule and divide by \( da \) to get:

\[
\frac{\partial l}{\partial a} = \frac{-1}{|H|} \frac{w}{p} \phi_{kk}
\]

\[
\frac{\partial k}{\partial a} > 0,
\]

and

\[
\frac{\partial k}{\partial a} = \frac{1}{|H|} \frac{w}{p} \phi_{kl}
\]

\[
\frac{\partial k}{\partial a} > 0
\]

Now let us consider the enterprise, taking into account the budget constraint. This enterprise manager maximizes a constrained objective function specified as (suppressing the superscripts and subscripts on \( l, k \) and \( E \)):

\[
L_3 = \phi(l,k) - \frac{r}{p}k - (1-a)\frac{w}{p}l
\]

\[
-\lambda[E+\phi(l,k)-(1+\beta(V_{A_0}))\frac{w}{p}l - \frac{p}{p}k + g_s - \delta]
\]

Differentiating with respect to \( l, k, \lambda \) and \( \delta \) the first order conditions are:
\[ \frac{\partial L_3}{\partial k} = \phi_k - \frac{r}{p} - \lambda \left[ \phi_k - \frac{r}{p} \right] = 0 \] 

\[ \frac{\partial L_3}{\partial \lambda} = -[E + \phi(\lambda, k) - (1+\beta(VA_o))^W - \frac{r}{p}k + g_s - \delta] = 0 \] 

\[ \frac{\partial L_3}{\partial \delta} = \lambda \leq 0. \]

From equations (318) and (319) we have:

\[ \frac{w}{p} = \frac{(1-\lambda)}{(1-\alpha)-\lambda(1+\beta(VA_o))} \phi_k \]

\[ \frac{r}{p} = \phi_k \]

From (322) we see that the enterprise also hires labor up to the point where the marginal product is equal to the cost of labor (the wage rate and bonuses). \( \lambda \) and \( \alpha \) represent the distortions of the budget constraint and the planners' desire for the enterprise to maximize a combination of value added and profits.

To determine the signs of \( \frac{\partial L}{\partial g_s} \) and \( \frac{\partial k}{\partial g_s} \), differentiate (318)-(320) with respect to \( g_s \) assuming \( \frac{\partial w}{\partial g_s} = \frac{\partial r}{\partial g_s} = \frac{\partial \lambda}{\partial g_s} = 0. \)

We get:

\[ \phi_k \frac{\partial L}{\partial g_s} - \lambda \phi_k \frac{\partial L}{\partial g_s} + \phi_k \frac{\partial k}{\partial g_s} - \lambda \phi_k \frac{\partial k}{\partial g_s} \]

\[- \frac{\partial L}{\partial g_s} \left[ \phi_k - (1+\beta(VA_o)) \frac{w}{p} \right] = 0 \]
(325) \[ \phi_{kk} \frac{\partial \ell}{\partial g_s} - \lambda \phi_{kk} \frac{\partial \ell}{\partial g_s} + \phi_{kl} \frac{\partial k}{\partial g_s} - \phi_{kk} \frac{\partial k}{\partial g_s} \]

\[ - \frac{\partial \lambda}{\partial g_s} \left[ \phi_k - \frac{r}{p} \right] = 0 \]

\[ (326) \quad -[\phi_k \frac{\partial \ell}{\partial g_s} - (1+\beta(VA_o))\frac{w}{p} \frac{\partial \ell}{\partial g_s} + \phi_k \frac{\partial k}{\partial g_s} - \frac{r}{p} \frac{\partial k}{\partial g_s} + 1] = 0 \]

Rewriting in matrix notation we have

\[ \begin{bmatrix} (1-\lambda)\phi_{kk} & (1-\lambda)\phi_{kl} & -(\phi_k-(1+\beta(VA_o))\frac{w}{p}) \\ (1-\lambda)\phi_{kl} & (1-\lambda)\phi_{kk} & -\phi_k + \frac{r}{p} \\ -(\phi_k-(1+\beta(VA_o))\frac{w}{p}) & -\phi_k + \frac{r}{p} & 0 \end{bmatrix} \begin{bmatrix} \frac{\partial \ell}{\partial g_s} \\ \frac{\partial k}{\partial g_s} \\ \frac{\partial \lambda}{\partial g_s} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \]

Denote the matrix on the left hand side as D. We know \( |D| > 0 \) for a maximum, and denote the term in the upper right hand and lower left hand corners as \(-d_{13} = -d_{31}\).

We can show \( d_{31} < 0 \) by substituting the value of \( \phi_k \) from the first order conditions to get:

\[ d_{31} = \left[ \frac{1-\lambda(1+\beta(VA_o)) - \alpha}{1-\lambda} \right] \frac{\partial \ell}{\partial g_s} - (1 + \beta(VA_o)) \frac{w}{p} \]

Then \( d_{13} \geq 0 \) as \( \left[ \frac{1-\lambda(1+\beta(VA_o)) - \alpha}{1-\lambda} \right] \geq \left[ 1 + \beta(VA_o) \right] \)

Rewriting, this condition becomes:

\[ \frac{1-\alpha}{1-\lambda} - \frac{\lambda}{1-\lambda} (1+\beta(VA_o)) \geq 1 + \beta(VA_o) \]

\[ \frac{(1-\alpha)}{1-\lambda} \geq \left[ \frac{\lambda}{1-\lambda} + 1 \right] (1+\beta(VA_o)) \text{ and } \frac{1-\alpha}{1-\lambda} \geq \frac{1}{(1-\lambda)} (1+\alpha(VA_o)) \]
Since $0 < (1-a) < 1$, $1 < (1+\beta(VA_o)) < 2$, $\lambda < 0$ we have $(1-\lambda) > 0$, $(1-a) < (1+\beta(VA_o))$ and therefore $d_{13} < 0$.

Now apply Cramer's rule to (327) to get:

$$\frac{\partial l}{\partial g_s} = \frac{1}{|D|} \begin{vmatrix} 0 & (1-\lambda) \phi_{kl} & -d_{13} \\ 0 & (1-\lambda) \phi_{kk} & -\phi_k + \frac{r}{p} \\ 1 & -\phi_k + \frac{r}{p} & 0 \end{vmatrix}$$

(328) \quad \frac{\partial l}{\partial g_s} = \frac{1}{|D|} (1-\lambda) \phi_{kk} d_{13} > 0

Similarly:

$$\frac{\partial k}{\partial g_s} = \frac{1}{|D|} \begin{vmatrix} (1-\lambda) \phi_{ll} & 0 & -d_{13} \\ (1-\lambda) \phi_{kl} & 0 & -\phi_k + \frac{r}{p} \\ -d_{31} & 1 & 0 \end{vmatrix}$$

(329) \quad \frac{\partial k}{\partial g_s} = -(1-\lambda) \phi_{kl} d_{13} > 0,

and

$$\frac{\partial \lambda}{\partial g_s} = \frac{1}{|D|} \begin{vmatrix} (1-\lambda) \phi_{ll} & (1-\lambda) \phi_{lk} & 0 \\ (1-\lambda) \phi_{kl} & (1-\lambda) \phi_{kk} & 0 \\ -d_{31} & -\phi_k + \frac{r}{p} & 1 \end{vmatrix}$$

(330) \quad \frac{\partial \lambda}{\partial g_s} = \frac{1}{|D|} (1-\lambda)[\phi_{ll} \phi_{kk} - \phi_{kl}^2] > 0
The signs of \( \frac{\partial \phi}{\partial r_p}, \frac{\partial \phi}{\partial r_p}, \frac{\partial \lambda}{\partial r_p} \) can be found in a similar manner differentiating (318)-(320) assuming \( \frac{\partial w}{\partial p}, \frac{\partial w}{\partial p}, \frac{\partial g_{13}}{\partial r_p} = 0 \).

Writing in matrix notation we have:

\[
\begin{bmatrix}
\phi_{11} & \phi_{1k} & -[w - (1 + \beta(VA_0))_p] \\
\phi_{11} & \phi_{kk} & 0 \\
-[w - (1 + \beta(VA_0))_p] & 0 & 0
\end{bmatrix}
\begin{bmatrix}
\frac{\partial \phi}{\partial r_p} \\
\frac{\partial \phi}{\partial r_p} \\
\frac{\partial \lambda}{\partial r_p}
\end{bmatrix} = 0
\]

Applying Cramer's rule yields:

\[
\frac{\partial \phi}{\partial r_p} = \frac{1}{|D|} d_{13}(1 - \lambda)\phi_{kk}(-k) < 0
\]

and

\[
\frac{\partial \lambda}{\partial r_p} = \frac{1}{|D|} (-\lambda)\phi_{kk}(-k) + d_{31}(1 - \lambda) < 0
\]

and

\[
\frac{\partial \lambda}{\partial r_p} = (1 - \lambda)^2[-\phi_{kk}d_{13} - k(\phi_{kk}^2 - \phi_{kk}^2)] \leq 0
\]

Similarly, \( \frac{\partial \phi}{\partial w}, \frac{\partial \phi}{\partial w}, \frac{\partial \phi}{\partial w} \) can be found by differentiating (318)-

(310), assuming \( \frac{\partial p}{\partial w} = \frac{\partial \alpha}{\partial w} = 0 \). In matrix notation we have:
\[
\begin{bmatrix}
(1-\lambda)\phi_{ll} & (1-\lambda)\phi_{lk} & -[\phi_k-(1+\beta(VA_o))\frac{w}{p}] \\
(1-\lambda)\phi_{kl} & (1-\lambda)\phi_{kk} & 0 \\
-[\phi_k-(1+\beta(VA_o))\frac{w}{p}] & 0 & 0 \\
\end{bmatrix}
\begin{bmatrix}
\frac{\partial \lambda}{\partial \wp} \\
\frac{\partial k}{\partial \wp} \\
\frac{\partial \lambda}{\partial \wp} \\
\end{bmatrix} = 
\begin{bmatrix}
(1-\alpha)-\lambda(1+\beta(VA_o)) \\
0 \\
-(1+\beta(VA_o)) \\
\end{bmatrix}
\]
Applying Cramer's rule:

\[
\frac{\partial \ell}{\partial w_p} = \frac{1}{|D|} \cdot d_{13}(1-\lambda)\phi_{kk}(-(1+\beta(VA_o))) < 0
\]

and

\[
\frac{\partial k}{\partial w_p} = \frac{1}{|D|} \cdot (-d_{13})(1-\lambda)\phi_{kk}(-(1+\beta(VA_o))) < 0
\]

and

\[
\frac{\partial \lambda}{\partial w_p} = \frac{1}{|D|} \left[ \left[ ((1-\alpha) - \lambda(1+\beta(VA_o))) \cdot (-d_{31})(1-\lambda)\phi_{kk} \right]
+ \left[ ((1+\beta(VA_o))\ell) \cdot ((1-\lambda)^2\phi_{kk} - (1-\lambda)\phi_{kk}) \right] \right] < 0
\]

To find the effect of changing \( \alpha \) on the enterprises' demand for labor and capital differentiate (318)-(320)
assuming \( d_{g_S} = d_{w_p} = d_{r_p} = 0 \). We get

\[
\phi_{lll} \frac{\partial \ell}{\partial \alpha} + \frac{w_p}{p} - \lambda \phi_{ll} \frac{\partial \ell}{\partial \alpha} + \phi_{lk} \frac{\partial k}{\partial \alpha} - \lambda \phi_{lk} \frac{\partial k}{\partial \alpha} - \frac{\partial \lambda}{\partial \alpha} \left[ \phi_k - (1 + \beta(VA_o)) \right] \frac{w_p}{p} = 0
\]

\[
\phi_{kl} \frac{\partial \ell}{\partial \alpha} - \lambda \phi_{kl} \frac{\partial \ell}{\partial \alpha} + \phi_{kk} \frac{\partial k}{\partial \alpha} - \lambda \phi_{kk} \frac{\partial k}{\partial \alpha} - \frac{\partial \lambda}{\partial \alpha} (\phi_k - \frac{r}{p}) = 0
\]

\[
\phi_{kl} \frac{\partial k}{\partial \alpha} - (1+\beta(VA_o)) \frac{w_p}{p} \frac{\partial \ell}{\partial \alpha} + \phi_{kk} \frac{\partial k}{\partial \alpha} - \frac{r}{p} \frac{\partial \ell}{\partial \alpha} = 0
\]

Rewriting in matrix notation we have:
(342) \[
\begin{bmatrix}
(1-\lambda)\phi_{k+l} & (1-\lambda)\phi_{k} & -d_{13} \\
(1-\lambda)\phi_{k+l} & (1-\lambda)\phi_{k} & -(\phi_{k} - \frac{r}{p}) \\
-d_{31} & -(\phi_{k} - \frac{r}{p}) & 0
\end{bmatrix}
\begin{bmatrix}
\frac{\partial k}{\partial \alpha} \\
\frac{\partial k}{\partial \alpha} \\
\frac{\partial \lambda}{\partial \alpha}
\end{bmatrix}
= \begin{bmatrix}
-\frac{w}{p} \\
0 \\
0
\end{bmatrix}
\]

Then applying Cramer's rule we have

(343) \[\frac{\partial k}{\partial \alpha} = \frac{-1}{|D|} \frac{w}{p} (\phi_{k} - \frac{r}{p})^2 = 0\]

(344) \[\frac{\partial k}{\partial \alpha} = -\frac{1}{|D|} \frac{w}{p} [(\phi_{k} - \frac{r}{p})(\phi_{k} - (1+\beta(VA_{o})\frac{w}{p})] = 0\]

(345) \[\frac{\partial \lambda}{\partial \alpha} = -\frac{1}{|D|} \frac{w}{p} [-(1-\lambda)\phi_{k+l}(\phi_{k} - \frac{r}{p}) +
\]
\[\phi_{k} - (1+\beta(VA_{o})\frac{w}{p})(1-\lambda)\phi_{k+l}] > 0\]

Equations (318)-(320) also yield an output supply function:

(346) \[y^S = y^S(w, \frac{r}{p}, g_s, \alpha)\]
\[-\quad + \quad \geq 0\]

where the signs below the variables are the signs of the partial derivatives. To examine the effect of a change in the real wage or real cost of capital totally differentiate equation (346). For simplicity, assume the real wage, the real cost of capital, $\alpha$ and $g_s$ are independent. We have
\[ dy^S = \phi_k \frac{\partial k^d}{\partial w_p} dw_p + \phi_k \frac{\partial k^d}{\partial r_p} dr_p + \phi_k \frac{\partial k^d}{\partial \alpha} d\alpha + \phi_k \frac{\partial k^d}{\partial g_s} dg_s \]

\[ + \phi_k \frac{\partial l^d}{\partial w_p} d\alpha + \phi_k \frac{\partial k^d}{\partial \alpha} d\alpha + \phi_k \frac{\partial l^d}{\partial g_s} dg_s \]

\[ \phi_k \frac{\partial k^d}{\partial g_s} dg_s \]

If we consider a change in the real wage \( \frac{dw}{p} > 0 \), \( \frac{dr}{p} \), \( d\alpha \), \( dg_s = 0 \),

(347) becomes:

(348) \[ dy^S = \phi_k \frac{\partial l^d}{\partial w_p} dw_p + \phi_k \frac{\partial k^d}{\partial w_p} \]

\[ \frac{dy^S}{\partial w_p} = \phi_k \frac{\partial l^d}{\partial w_p} + \phi_k \frac{\partial k^d}{\partial w_p} \]

\[ \frac{dy^S}{\partial w_p} < 0 \]

Similarly, for a change in the real price of capital we have:

(349) \[ dy^S = \phi_k \frac{\partial l^d}{\partial r_p} dr_p + \phi_k \frac{\partial k^d}{\partial r_p} \]

\[ \frac{dy^S}{\partial r_p} = \phi_k \frac{\partial l^d}{\partial r_p} + \phi_k \frac{\partial k^d}{\partial r_p} \]

\[ \frac{dy^S}{\partial r_p} < 0 \]

For changes in \( \alpha \), assuming \( \frac{dr}{p} \), \( \frac{dw}{p} \), \( dg_s = 0 \), we have:

(350) \[ dy^S = \phi_k \frac{\partial l^d}{\partial \alpha} d\alpha + \phi_k \frac{\partial k^d}{\partial \alpha} \]

\[ \frac{dy^S}{\partial \alpha} = \phi_k \frac{\partial l^d}{\partial \alpha} + \phi_k \frac{\partial k^d}{\partial \alpha} \]

\[ \frac{dy^S}{\partial \alpha} < 0 \]
and for changes is $g_S$:

$$\frac{\partial y^S}{\partial g_S} = \phi_k \frac{\partial k^d}{\partial g_S} + \phi_k \frac{\partial k^d}{\partial g_S}$$

$$\frac{\partial y^S}{\partial g_S} > 0$$

We see then that enterprises react to changes in $\frac{w}{p}$ and $\frac{r}{p}$

(whether caused by market pressures or central planners)

in a manner similar to the profit maximizing firm under
perfect competition. In addition, if the central planners in-
crease $\alpha$ enterprises not faced with the budget constraint
will increase the amount of labor and capital inputs pur-
chased and increase the level of output produced. If

planners increase the level of subsidies ($g_S$) to enterprises,
the enterprise purchases more of both labor and capital.

In the enterprise deposit market we see that, like
the household, the enterprise simultaneously determines its
demand for enterprise deposits (from equation (34) when it
determines its demand for capital and labor, and supply of
output. Thus, we can write:

$$e^d = e^d(\frac{w}{p}, \frac{r}{p}, g_S, \alpha)$$

$$\text{+ - + -}$$

where the signs beneath the variables are the signs of the
partial derivatives. They can be verified by totally
differentiating (34) to get:
(353) \[ e^d = \left[ \phi_k - (1 + \beta(VA_o)) \right] \frac{w}{p} \frac{\partial w}{\partial k} + k \frac{1}{p} (1 + \beta(VA_o)) - \left[ \phi_k - \frac{r}{p} \frac{\partial k}{\partial w} \right] \frac{d \frac{w}{p}}{p} \]

\[ + \left[ \phi_k - (1 + \beta(VA_o)) \right] \frac{w}{p} \frac{\partial w}{\partial g_s} + \left[ \phi_k - \frac{r}{p} \frac{\partial k}{\partial g_s} \right] \frac{d g_s}{p} \]

\[ + \left[ \phi_k - (1 + \beta(VA_o)) \right] \frac{w}{p} \frac{\partial w}{\partial a} + \left[ \phi_k - \frac{r}{p} \frac{\partial k}{\partial a} \right] \frac{d a}{p} \]

Assuming \( \frac{d}{p}, \frac{d g_s}{p}, \frac{d a}{p} = 0 \), we get

(354) \[ \frac{d e^d}{d w} = \left[ \phi_k - (1 + \beta(VA_o)) \right] \frac{w}{p} \frac{\partial w}{\partial k} - k \frac{1}{p} (1 + \beta(VA_o)) \]

\[ \frac{d e^d}{d w} \quad \forall \quad 0 \]

Note that \( \phi_k - (1 + \beta(VA_o)) \frac{w}{p} = d_{13} < 0 \). The first term indicates that as a result of an increase, say, in the wage rate the enterprise hires fewer workers. Total expenditures on labor decrease by \( (1 + \beta(VA_o)) \frac{w}{p} \) times that decrease. Total revenue decreases as well by \( \phi_k \frac{\partial w}{\partial w} \). The first term then represents the net decrease in expenditures on the change in labor and therefore an increase in demand for enterprise deposits. The second term however indicates the additional amount each remaining worker must be paid and thus measures a decrease in demand for enterprise
deposits as a result of the higher wage. We see then
\[ \frac{\partial s_p}{\partial w_p} \] may be positive or negative depending on which effect
is greater. (We would expect it to be negative.)

Assuming \( d_w, d_s, d\alpha = 0 \), we have

\[ d \frac{\partial s_p}{\partial r_p} = \left[ \phi_k - (1 + \beta(VA_o))^\frac{w_p}{p} \frac{\partial r}{\partial r_p} \right] - k \]

\[ \frac{\partial s_p}{\partial r_p} \leq 0 \]

We see that the first term represents a decrease in expenditure on labor as a result of the change in price of capital and thus is an increase in demand for enterprise deposits. However as a result of the increase in the price of capital each unit of capital must be paid that much more so that expenditures on capital increase and (-k) represents the corresponding decrease in demand for enterprise deposits.

Again \( \frac{\partial s_d}{\partial r_p} \) may be positive or negative depending on which effect is greater. (Again we would expect it to be negative.) Now assuming \( d_w, d_r, d\alpha = 0 \), we get

\[ d \frac{\partial s_p}{\partial s_s} = \left[ \phi_k - (1 + \beta(VA_o))^\frac{w_p}{p} \right] \frac{\partial s}{\partial s_s} + \left[ \phi_k - \frac{r}{p} \right] \frac{\partial k}{\partial s_s} + 1 \]

\[ \frac{\partial s_p}{\partial s_s} \leq 0 \]
In this case there is a net increase in the expenditures on labor, as $g_s$ induces enterprises to purchase more labor and capital services, and a corresponding decrease in demand for deposits. We assume that the net increase in expenditures is less than the amount of subsidies. That is the enterprise maintains a certain part of the subsidies for transactions purposes, or for precautionary reasons. As a result:

$$[\phi_l - (1 + \beta(VA_o)) \frac{w}{p} \frac{\partial \lambda}{\partial g_s}] < 1$$

and the demand for enterprise deposits increases.

Lastly, assuming $d_w, d_k = 0$, we get:

$$\frac{\partial e_d}{\partial p} = [\phi_l - (1 + \beta(VA_o)) \frac{w}{p} \frac{\partial \lambda}{\partial g_s} + [\phi_k - \frac{r \gamma}{p} \frac{\partial k}{\partial \alpha}$$

$$\frac{\partial e_d}{\partial \alpha} < 0$$

An increase in $\alpha$ induces the enterprise to hire more labor, if the budget constraint is not binding. The additional revenue that labor brings in is $\phi_l$ but it costs the enterprise $(1 + \beta(VA_o)) \frac{w}{p}$. Thus the demand for enterprise deposits falls by the difference between the two, as indicated in equation (357) above.
APPENDIX D

The Impact of Changing the Planners' Weight, \( \alpha \),
on the Real Wage, the Real Price
of Capital Services and the Level
of Wealth
The basic model from equations (79)-(83) may be written as:

\begin{align*}
(358) \quad & L^d_w(p, r, g_s, a) - L^s_w(p, \Omega, g_p) = 0 \\
& - - + + + - - - \\
(359) \quad & y^d_w(p, r, \Omega, g_s, g_p, a) - y^s_w(p, r, g_s, a) \\
& + - - + + - - - \geq 0 \\
(360) \quad & \frac{m^d}{p}(w, p, \Omega, g_p) + \frac{e^d}{p}(w, r, g_s, a) - \frac{e^s}{p} = 0 \\
& - + + - - 0 + \\
\end{align*}

To determine the impact of a change in \(a\), assuming no other changes in government policy parameters \((g_s, g_p, \frac{e^s}{p})\) we totally differentiate equations (358)-(360) to get

\begin{align*}
(361) \quad & \frac{\partial L^d}{\partial w}dw^p - \frac{\partial L^s}{\partial w}dw^p + \frac{\partial L^d}{\partial r}dr^p + \frac{\partial L^d}{\partial \alpha}d\alpha - \frac{\partial L^s}{\partial \Omega}d\Omega = 0 \\
(362) \quad & \frac{\partial y^d}{\partial w}dw^p - \frac{\partial y^s}{\partial w}dw^p + \frac{\partial y^d}{\partial r}dr^p + \frac{\partial y^d}{\partial \alpha}d\alpha - \frac{\partial y^s}{\partial \Omega}d\Omega = 0 \\
(363) \quad & \frac{\partial m^d}{\partial w}dw^p + \frac{\partial \bar{e}^d}{\partial w}d\bar{e}^p + \frac{\partial \bar{e}^d}{\partial \alpha}d\alpha = 0 \\
\end{align*}

Rewriting in matrix notation we have:
\[
\begin{bmatrix}
\frac{\partial \lambda^d}{\partial \omega} - \frac{\partial \lambda^s}{\partial \omega} & \frac{\partial \lambda^d}{\partial \omega} & \frac{\partial \lambda^s}{\partial \omega} & \frac{\partial \lambda^s}{\partial \omega} & \frac{\partial \lambda^d}{\partial \omega} - \frac{\partial \lambda^s}{\partial \omega} & \frac{\partial \lambda^d}{\partial \omega} - \frac{\partial \lambda^s}{\partial \omega} \\
\frac{\partial y^d}{\partial \omega} - \frac{\partial y^s}{\partial \omega} & \frac{\partial y^d}{\partial \omega} - \frac{\partial y^s}{\partial \omega} & \frac{\partial y^d}{\partial \omega} - \frac{\partial y^s}{\partial \omega} & \frac{\partial y^d}{\partial \omega} - \frac{\partial y^s}{\partial \omega} & \frac{\partial y^d}{\partial \omega} - \frac{\partial y^s}{\partial \omega} & \frac{\partial y^d}{\partial \omega} - \frac{\partial y^s}{\partial \omega} \\
\frac{\partial \omega}{\partial \omega} + \frac{\partial \omega}{\partial \omega} & 0 & 0 & 0 & \frac{\partial \omega}{\partial \omega} & \frac{\partial \omega}{\partial \omega}
\end{bmatrix}
\]

If we denote the matrix on the left hand side as \(A\) and the elements of \(A\) as \(a_{ij}\) and the vector on the right hand side as \(b\) we have:

(365) \(a_{11} < 0\) from the basic stability conditions
(366) \(b_2 < 0\) from the equations (316) and (350)
(367) \(a_{22} > 0\) from the stability conditions in the capital service market (assuming quantity adjustments are more likely, the Marshallian conditions are the relevant ones).

(368) \(a_{21} > 0\) (see Barro and Grossman [ ], p. 29).
(369) \(a_{31} < 0\) from equations (354) and (271) \(a_{31}\) is most likely negative.

Then we have

(370) \(|A| = a_{31} \cdot \left[ \frac{\partial \lambda^d}{\partial r} \frac{\partial y^d}{\partial \omega} + \frac{\partial \lambda^s}{\partial \omega} a_{22} \right]\), then
\[ |A| < 0 \text{ if } a_{31} > 0 \text{ and } |A| > 0 \text{ if } a_{31} < 0. \]

Assuming \( a_{31} < 0 \) we have:

\[
\frac{\partial (p^*)}{\partial a^-} = \frac{1}{|A|} \cdot \left[ \frac{\partial \psi}{\partial \alpha} \cdot \left[ \frac{\partial \psi}{\partial \zeta} \cdot \partial \psi + \frac{\partial \zeta}{\partial \alpha} + \frac{\partial \zeta}{\partial \zeta} \cdot a_{22} \right] + a_{31} \cdot \left[ - \frac{\partial \psi}{\partial \alpha} \cdot \frac{\partial \psi}{\partial \zeta} + b_2 \frac{\partial \zeta}{\partial \zeta} - \frac{\partial \alpha}{\partial \zeta} \cdot \left( a_{11} \frac{\partial \psi}{\partial \zeta} + a_{22} \frac{\partial \zeta}{\partial \zeta} \right) \right] \right] > 0
\]

and

\[
\frac{\partial (p^*)}{\partial a^-} < 0 \text{ if } \left| \frac{\partial \psi}{\partial \alpha} \cdot \frac{\partial \psi}{\partial \zeta} \right| < \left| b_2 \frac{\partial \zeta}{\partial \zeta} \right|
\]

\[
\frac{\partial (p^*)}{\partial a^-} > 0 \text{ if } \left| \frac{\partial \psi}{\partial \alpha} \cdot \frac{\partial \psi}{\partial \zeta} \right| > \left| b_2 \frac{\partial \zeta}{\partial \zeta} \right| \text{ and }
\]

\[
\left| a_{31} \cdot \left[ - \frac{\partial \psi}{\partial \alpha} \cdot \frac{\partial \psi}{\partial \zeta} + b_2 \frac{\partial \zeta}{\partial \zeta} - \frac{\partial \alpha}{\partial \zeta} \cdot \left( a_{11} \frac{\partial \psi}{\partial \zeta} + a_{22} \frac{\partial \zeta}{\partial \zeta} \right) \right] > \frac{\partial \psi}{\partial \alpha} \cdot \left( a_{11} \frac{\partial \psi}{\partial \zeta} + a_{22} \frac{\partial \zeta}{\partial \zeta} \right) \right|
\]

and

\[
\frac{\partial \zeta}{\partial a^-} = \frac{1}{|A|} \cdot \left[ a_{31} \cdot \left[ \frac{\partial \psi}{\partial \alpha} \cdot b_2 + \frac{\partial \alpha}{\partial \zeta} \cdot a_{22} \right] + \frac{\partial \psi}{\partial \alpha} \cdot \left( a_{11} a_{22} - a_{21} \frac{\partial \psi}{\partial \zeta} \right) \right]
\]
\[
\frac{\partial \Omega^*}{\partial \alpha^*} > 0 \text{ if } |a_{11} a_{22}| < |a_{21} \frac{\partial \xi^d}{\partial \rho}| \text{ and }
\]
\[
\left| \frac{\partial c^d}{\partial \alpha} [a_{11} a_{22} - a_{21} \frac{\partial \xi^d}{\partial \rho}] \right| >
\]
\[
|a_{31} \left[ \frac{\partial \xi^d}{\partial \rho} b_2 + \frac{\partial \xi^d}{\partial \alpha} a_{22} \right]|
\]

Thus we expect the real wage to increase but the real price of capital services and the level of wealth, \( \Omega \), may increase or decrease.
APPENDIX E

Derivation of Sectoral Excess Demands
From the disaggregated model of section 5.1 we have the following set of equations describing the excess demand in each market; the labor market, the markets for A and B type consumer goods, the markets for A and B type capital services, and the money market:

(377) \[ E^d_A = l^d_A(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) + \]
\[ - + - - + + \]
\[ l^d_B(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) - \]
\[ - - + - - + + \]
\[ \varepsilon^S(w, P_A, P_B, \Omega, \varepsilon_p) + \]
\[ - - - - + \]

(378) \[ E^d_{c_A} = c^d_A(w, P_A, P_B, \Omega, \varepsilon_p) - c^S_A(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) + \]
\[ + - + + + - - - - + + \]

(379) \[ E^d_{c_B} = c^d_B(w, P_A, P_B, \Omega, \varepsilon_p) - c^S_B(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) + \]
\[ + + - + + - - + + + \]
\[ + + \]
\[ - - - - - - + + \]

(380) \[ E^d_{k_A} = k^d_A(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) - k^S_A(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) - \]
\[ + + - + + + - - - + + + \]
\[ - - - - - - + + \]
\[ + + \]

(381) \[ E^d_{k_B} = k^d_B(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) - k^S_B(w, P_A, P_B, r_A, r_B, \varepsilon_S, \alpha) - \]
\[ + + + - + + - - - + + \]
\[ - - - - - - + + \]

(382) \[ E^d_m = m^d(w, P_A, P_B, \Omega, \varepsilon_p) + e^d(w, r_A, r_B, P_A, P_B, \varepsilon_S, \alpha) + \]
\[ + - - + + - - - + + + + \]
\[ - \varepsilon^S \]
Totally differentiating assuming \( g_s, \alpha, g_p \) and \( \Omega \) are constant we get:

\[
(383) \quad dE^d \bigg|_C = \left[ \frac{\partial f}{\partial w} + \frac{\partial f}{\partial w} - \frac{\partial g}{\partial w} \right] \, dw + \left[ \frac{\partial g}{\partial P_A} + \frac{\partial g}{\partial P_A} - \frac{\partial h}{\partial P_A} \right] \, dP_A + \\
\left[ \frac{\partial f}{\partial B} + \frac{\partial f}{\partial B} - \frac{\partial g}{\partial B} \right] \, dP_B + \left[ \frac{\partial g}{\partial r_A} + \frac{\partial g}{\partial r_A} \right] \, dr_A + \\
\left[ \frac{\partial f}{\partial B} + \frac{\partial f}{\partial B} - \frac{\partial g}{\partial B} \right] \, dr_B
\]

\[
(384) \quad dE^d \bigg|_A = \left[ \frac{\partial c}{\partial w} - \frac{\partial c}{\partial w} \right] \, dw + \left[ \frac{\partial c}{\partial P_A} - \frac{\partial c}{\partial P_A} \right] \, dP_A + \\
\left[ \frac{\partial c}{\partial B} - \frac{\partial c}{\partial B} \right] \, dP_B - \frac{\partial c}{\partial r_A} \, dr_A - \frac{\partial c}{\partial r_B} \, dr_B
\]

\[
(385) \quad dE^d \bigg|_B = \left[ \frac{\partial c}{\partial w} - \frac{\partial c}{\partial w} \right] \, dw + \left[ \frac{\partial c}{\partial P_A} - \frac{\partial c}{\partial P_A} \right] \, dP_A + \\
\left[ \frac{\partial c}{\partial B} - \frac{\partial c}{\partial B} \right] \, dP_B - \frac{\partial c}{\partial r_A} \, dr_A - \frac{\partial c}{\partial r_B} \, dr_B
\]

\[
(386) \quad dE^d \bigg|_A = \left[ \frac{\partial k}{\partial w} - \frac{\partial k}{\partial w} \right] \, dw + \left[ \frac{\partial k}{\partial P_A} - \frac{\partial k}{\partial P_A} \right] \, dP_A + \\
\left[ \frac{\partial k}{\partial P_B} - \frac{\partial k}{\partial P_B} \right] \, dP_B + \\
\left[ \frac{\partial k}{\partial r_A} - \frac{\partial k}{\partial r_A} \right] \, dr_A + \left[ \frac{\partial k}{\partial r_B} - \frac{\partial k}{\partial r_B} \right] \, dr_B
\]
\[ (387) \quad dE^d_{k_B} = \left[ \frac{\partial k^d_B}{\partial w} - \frac{\partial k^s_B}{\partial w} \right] dw + \left[ \frac{\partial k^d_B}{\partial P_A} - \frac{\partial k^s_B}{\partial P_A} \right] dP_A + \left[ \frac{\partial k^s_B}{\partial P_B} - \frac{\partial k^s_B}{\partial P_B} \right] dP_B^+ \\
\quad \quad \quad + \left[ \frac{\partial k^d_B}{\partial r_A} - \frac{\partial k^s_B}{\partial r_A} \right] dr_A + \left[ \frac{\partial k^d_B}{\partial r_B} - \frac{\partial k^s_B}{\partial r_B} \right] dr_B \]

\[ (388) \quad dE^d_{m} = \left[ \frac{\partial m^d}{\partial w} + \frac{\partial e^d}{\partial w} \right] dw + \left[ \frac{\partial m^d}{\partial P_A} + \frac{\partial e^d}{\partial P_A} \right] dP_A + \left[ \frac{\partial m^d}{\partial P_B} + \frac{\partial e^d}{\partial P_B} \right] dP_B \]

Then rewriting in terms of elasticities we have:
\[
\begin{split}
(389) \quad &\begin{bmatrix}
\frac{1}{w} \left[ e_A + e_B - e_c \right] & \frac{1}{w} \left[ e_A + e_B - e_c \right] & \frac{1}{w} \left[ e_A + e_B - e_c \right] & \frac{1}{w} \left[ e_A + e_B - e_c \right]
\end{bmatrix}
\begin{bmatrix}
\frac{1}{r_A} \left[ e_A + e_B - e_c \right] & \frac{1}{r_B} \left[ e_A + e_B - e_c \right] & \frac{1}{r_B} \left[ e_A + e_B - e_c \right] & \frac{1}{r_B} \left[ e_A + e_B - e_c \right]
\end{bmatrix}
\begin{bmatrix}
\frac{1}{w} \left[ e_A + e_B - e_c \right] & \frac{1}{w} \left[ e_A + e_B - e_c \right] & \frac{1}{w} \left[ e_A + e_B - e_c \right] & \frac{1}{w} \left[ e_A + e_B - e_c \right]
\end{bmatrix}
\left[ \begin{bmatrix}
d\omega \\
d\xi_A \\
d\xi_B \\
d\xi_m \\
\end{bmatrix}
\right]
= \left[ \begin{bmatrix}
d\xi_d \\
d\xi_d \\
d\xi_d \\
d\xi_d \\
\end{bmatrix}
\right]
\end{split}
\]
Now if we consider the example outlined in section 5.1

where $dE_{\text{cB}}^d = 0$ and $dE_{\text{cB}}^d + P_B d\xi_{\text{cB}} = 0$  \[ P_B d\xi_{\text{cB}} = -d\xi_m \\

we have:

(390) $dE_{\xi}^d = \frac{dP_B}{P_B} \left[ \xi_{\text{cB}} P_B + \xi_{\text{cB}} P_B - \xi_{\text{cB}} P_B \right] + \frac{dP_B}{r_B} \left[ \xi_{\text{cB}} P_B + \xi_{\text{cB}} P_B \right] = 0$

(391) $dE_{\text{cB}}^d = \frac{dP_B}{r_B} \left[ c_{\text{cB}} - c_{\text{cB}} \right] - \frac{dP_B}{r_B} \xi_{\text{cB}} = 0$

(392) $dE_{\xi}^d = \frac{dP_B}{r_B} \left[ c_{\text{cB}} - c_{\text{cB}} \right] - \frac{dP_B}{r_B} \xi_{\text{cB}} = P_B d\xi_{\text{cB}}^*$

(393) $dE_{\xi}^d = \frac{dP_B}{r_B} \left[ c_{\text{cB}} - c_{\text{cB}} \right] - \frac{dP_B}{r_B} \xi_{\text{cB}} = 0$

(394) $dE_{\xi}^d = \frac{dP_B}{r_B} \left[ c_{\text{cB}} - c_{\text{cB}} \right] - \frac{dP_B}{r_B} \xi_{\text{cB}} = 0$

(395) $dE_{\xi}^d = \frac{dP_B}{r_B} \left[ c_{\text{cB}} - c_{\text{cB}} \right] + \frac{dP_B}{r_B} \xi_{\text{cB}} = 0$

We can solve for $\frac{dP_B}{r_B} = \hat{P}_B$, and $\frac{dP_B}{r_B} = \hat{P}_B$. From equations

(392) and (393) we have:

(396) $\hat{P}_B \xi_{\text{cB}} P_B \left[ c_{\text{cB}} - c_{\text{cB}} \right] - \hat{P}_B \xi_{\text{cB}} P_B + P_B d\xi_{\text{cB}}^* = 0$

(397) $k_B \hat{P} B \left[ c_{\text{cB}} - c_{\text{cB}} \right] + k_B \hat{P}_B \left[ c_{\text{cB}} - c_{\text{cB}} \right] = 0$
Solving for \( \hat{r}_B \) in (396), substituting into (397) and simplifying we have:

\[
\hat{r}_B = \frac{c_B \left( \epsilon_{P_B} - \epsilon_{P_B} \right)}{c_B \left( \epsilon_{P_B} - \epsilon_{P_B} \right) + \left( \epsilon_{r_{B}} - \epsilon_{r_{B}} \right) \left( \epsilon_{t_{P_B}} - \epsilon_{t_{P_B}} \right)}
\]

and

\[
\hat{r}_B > 0 \text{ if } \left( \epsilon_{r_{B}} - \epsilon_{r_{B}} \right) \left( \epsilon_{t_{P_B}} - \epsilon_{t_{P_B}} \right) > \left| \epsilon_{r_{B}} \left( \epsilon_{P_B} - \epsilon_{P_B} \right) \right|
\]

This of course assumes that all of the elasticities have the normally expected signs. Namely \( \epsilon_{r_{B}} > 0, \epsilon_{t_{P_B}} > 0, \epsilon_{P_B} < 0, \epsilon_{t_{P_B}} < 0. \) In general we would expect \( \hat{r}_B > 0. \)

One possible, but very unlikely case in Poland, in which \( \hat{r}_B < 0 \) would be the case in which a small increase in the price of B capital services would induce so many new firms to enter the market that the supply of B capital services shifts further to the right than the demand curve does after the markets reach a new equilibrium. This, however, implies a downward sloping long run supply curve due to decreasing costs of production or continuing economies of scale.

Since the state would desire to produce any goods which have these characteristics, and eliminate any potential monopoly power for the enterprises which produce
them, we would expect these goods to be classified as A
goods rather than B goods. As a result it seems safe to
assume that condition (399) holds and $\hat{P}_B > 0$.

To determine the sign of $\hat{P}_B$ we can now examine (396) to get

$$\hat{P}_B = \frac{\hat{r}_B - \hat{c}_B}{\hat{r}_B}$$

(400)

To determine the exact magnitude of $\hat{P}_B$
substitute $\hat{r}_B$ from (398) into (400) and simplify to get

$$\hat{P}_B = \frac{\hat{c}_B}{\hat{c}_B}$$

(401)

From this expression alone we can also determine the sign
of $\hat{P}_B$:

$$\text{sign } \hat{P}_B = \text{sign } \frac{\frac{k_B - k_B}{(\hat{r}_B - \hat{c}_B)} (\hat{r}_B + 1) + 1}{\frac{k_B - k_B}{(\hat{r}_B - \hat{c}_B)}}$$

This can be rewritten as:

$$\text{sign } \hat{P}_B = \text{sign } \frac{\frac{k_B - k_B}{(\hat{r}_B - \hat{c}_B)} \hat{c}_B + \frac{k_B - k_B}{(\hat{r}_B - \hat{c}_B)} + 1}{\frac{k_B - k_B}{(\hat{r}_B - \hat{c}_B)}}$$
This implies:

\[
\hat{p}_B > 0 \text{ if } \begin{vmatrix} k_B & k_B \\ \left(\tau_B - \epsilon_B \right) & \left(\tau_B - \epsilon_B \right) \end{vmatrix} < \frac{k_B}{k_B} \frac{k_B}{k_B} \frac{\epsilon_B}{\epsilon_B + 1} \frac{c_B}{c_B}
\]

or \[\hat{p}_B > 0 \text{ if } \left| \epsilon_{r,B} \right| > \begin{vmatrix} k_B & k_B \\ \left(\tau_B - \epsilon_B \right) & \left(\tau_B - \epsilon_B \right) \end{vmatrix} \]

Rewriting we have:

\[
\hat{p}_B > 0 \text{ if } \left| \epsilon_{r,B} \left(\tau_B - \epsilon_B \right) \right| > \left| \tau_B - \epsilon_B \right|
\]

Again this assumes that all of the elasticities have the normally expected signs. Namely \( \epsilon_{r,B}, \tau_B, \tau_B, \epsilon_{r,B} < 0 \)

\( k_B, c_B, k_B < 0 \)

and \( \epsilon_{r,B}, \epsilon_{r,B}, \tau_B > 0 \).
APPENDIX F

Derivation of Demand for B-Type Consumer Goods
and the Supply of Labor Under Conditions of
Excess Demand for A-type Consumer Goods
Let us consider first the representative household which maximizes the utility function:

\[ U = U(c_A^d, c_B^d, \ell^S, g_p) \]

where all variables are as defined in the text, subject to a budget constraint

\[ M + b - T + w\ell^S - P_A c_A^d - P_B c_B^d = 0 \]

where bonuses and taxes are exogenous for simplicity. Below we shall consider the case in which the household is also constrained by the available supply of A type consumer goods, which we assume to be \( \bar{a} \),

\[ \bar{a} = c_A \]

First let us consider the maximization of \( U \) subject to the budget constraint. We maximize

\[ V_1 = U(c_A^d, c_B^d, \ell^S, g_p) + \lambda_1(M + b - T + w\ell^S - P_A c_A^d - P_B c_B^d) \]

The first order conditions, omitting the superscripts on \( c_A, c_B \) and \( \ell \), are

\[ \frac{dV_1}{dc_A} = U_c c_A - \lambda_1 P_A = 0 \]

\[ U_c c_B - \lambda_1 P_B = 0 \]

\[ U_{\ell^S} + \lambda_1 w = 0 \]

\[ M + b - T + w\ell^S - P_A c_A^d - P_B c_B^d = 0 \]
Totally differentiating and writing in matrix notation we have:

\[
\begin{bmatrix}
U_{c_A}c_A & U_{c_A}c_B & U_{c_A}\mu & -P_A \\
U_{c_B}c_A & U_{c_B}c_B & U_{c_B}\mu & -P_B \\
U_{\lambda}\mu & U_{\lambda}\mu & U_{\lambda}\mu & w \\
-P_A & -P_B & w & 0
\end{bmatrix}
\begin{bmatrix} dc_A \\ dc_B \\ d\lambda \\ d\lambda_1 \end{bmatrix}
= \begin{bmatrix}
\lambda_1 dP_A \\
\lambda_1 dP_B \\
-d\lambda_1 dw \\
-c^d_A dP_A + c^d_B dP_B - \lambda^S d\lambda_1 w
\end{bmatrix}
\]

Then using Cramer's rule, denoting the matrix on the left hand side as \( R \) and \( R_{ij} \) as the cofactor of the \( ij \)th element we have:

\[
dc_A = \lambda_1 dP_A |R_{11}| + \lambda_1 dP_B |R_{21}| - \lambda_1 dw |R_{31}| + (c^d_A dP_A + c^d_B dP_B - \lambda^S dw) |R_{51}| / |R|
\]

\[
dc_B = \lambda_1 dP_A |R_{12}| + \lambda_1 dP_B |R_{22}| - \lambda_1 dw |R_{32}| + (c^d_A dP_A + c^d_B dP_B - \lambda^S dw) |R_{52}| / |R|
\]

\[
d\lambda^S = \lambda_1 dP_A |R_{13}| + \lambda_1 dP_B |R_{23}| - \lambda_1 dw |R_{33}| + (c^d_A dP_A + c^d_B dP_B - \lambda^S dw) |R_{53}| / |R|
\]
From the first order conditions we can derive the demand for A and B type consumer goods and the supply of labor.

\[(414) \quad c^d_A = c^d_A (P_A, P_B, w, g_p, \Omega) \]
\[\quad - + + \pm + \]

\[(415) \quad c^d_B = c^d_B (P_A, P_B, w, g_p, \Omega) \]
\[\quad + - + \pm + \]

\[(416) \quad \ell^s = \ell^s (P_A, P_B, w, g_p, \Omega). \]
\[\quad - - + \pm - \]

where the signs below the variables are the signs of the partial derivatives, found using (411)-(413), for \(P_A\), \(P_B\), and \(w\) and the arguments of Appendix B for \(g_p\) and \(\Omega\).

Now if we consider the case in which the household faces the constraint or the availability of A consumer goods we maximize

\[(417) \quad V_2 = U(c^d_A, c^d_B, \ell^s, g_p) + \lambda_1 (M + b - T + w \ell^s - P_A c^d_A - P_B c^d_B) + \lambda_2 (a - c_A) \]

The first order conditions, again omitting the superscripts on \(c_A, c_B, \ell\), are:

\[(418) \quad U_{c_A} - \lambda_1 P_A - \lambda_2 = 0 \]

\[(419) \quad U_{c_B} - \lambda_1 P_B = 0 \]

\[(420) \quad U_{\ell} - \lambda_1 \cdot w = 0 \]
(421) \[ M + b - T + w - P_A c_A - P_A c_B = 0 \]

(422) \[ \overline{a} - c_A = 0 \]

Totally differentiating and writing in matrix notation we have:

\[
\begin{bmatrix}
U c_A c_A & U c_A c_B & U c_A \ell & -P_A & -1 \\
U c_B c_A & U c_B c_B & U c_B \ell & -P_B & 0 \\
\ell c_A & \ell c_B & \ell \ell & w & 0 \\
-P_A & -P_B & w & 0 & 0 \\
-1 & 0 & 0 & 0 & 0
\end{bmatrix}
\begin{bmatrix}
dc_A \\
dc_B \\
d\ell \\
d\lambda_1 \\
d\lambda_2
\end{bmatrix}
= \begin{bmatrix}
\lambda_1 dP_A \\
\lambda_1 dP_B \\
-\lambda_1 d\ell \\
c_A dP_A + c_B dP_B \\
d\overline{a}
\end{bmatrix}
\]

(423)

If we denote the matrix on the left hand side as \( H \) and the cofactor of the \( ij^{th} \) element as \( H_{ij} \) then

(424) \[ \frac{\partial c_B}{\partial \overline{a}} = \frac{-|H_{52}|}{|H|} \]

Intuitively we would expect \( \frac{\partial c_B}{\partial \overline{a}} \) to be less than zero for substitutes and greater than zero for complements.

Tobin and Houthaker [214] in their study of the effects of rationing in a market economy show that \( \frac{\partial c_B}{\partial \overline{a}} < 0 \) for Hicks-Allen substitutes and \( \frac{\partial c_B}{\partial \overline{a}} > 0 \) for Hicks-Allen complements when the utility function is quasi-concave and
there is no change in the prices of other goods or income when the constraint, \( \bar{a} \), changes. Howard [107] proves this result for the more general case in which the constraint is not at the market clearing level. Further, Howard [107] shows that the same result will hold if there is more than one constrained commodity.

In general then we can solve the first order conditions for the demand for B goods and the supply of labor:

\[
\begin{align*}
c_A &= \bar{a} \\
c_B^d &= c_B^d(w, P_B, c_A, \Omega, \varepsilon_p) \\
\lambda^s &= \lambda^s(w, P_B, c_A, \Omega, \varepsilon_p)
\end{align*}
\]
APPENDIX G

Derivation of the Internal and External Balance Loci
Internal balance in the hypothetical MCPE requires equilibrium in both the goods market (expenditures) and the money market. If both are in equilibrium then via Walras' law the labor market will be as well. Equilibrium in the goods market, or what we may term the expenditures sector, requires that there is zero excess demand for goods and services, including foreign sources. Thus we may write:

\[(425) \quad -E_d^d(P_A, g_{net}, \alpha) - B(P_A, \alpha, g_{net}, R) = 0\]

as the internal balance equation for the expenditures sector written in terms of the policy variables which the central planners control. The locus of points which satisfy this equation is called the IBE curve. If planners value price stability they will be reluctant to change either \(P_A\) or \(R\), so the most likely policy variables that the central planners will use are \(g_{net}\) and \(\alpha\), where \(g_{net} = g^d - T\). Thus we have by implicit differentiation

\[(426) \quad \frac{\partial \alpha}{\partial g_{net}} \bigg|_{IBE} = \frac{-\left[ -\frac{\partial E_d^d}{\partial g_{net}} - \left( \frac{\partial B}{\partial g_{net}} \right) \right]}{-\left[ -\frac{\partial E_d^d}{\partial \alpha} - \left( \frac{\partial B}{\partial \alpha} \right) \right]} > 0}\]

The sign of this expression may be seen more clearly when the sign of each component is determined. For the impact of changes in \(g_{net}\) we have:
\[ \frac{\partial E_{gds}}{\partial g_{net}} = \left[ \begin{array}{ccc} c_A^d & - & - \\ \frac{\partial c_A^d}{\partial g_{net}} & \frac{\partial c_B}{\partial g_{net}} & \frac{\partial T}{\partial g_{net}} \end{array} \right] \] 

and:

\[ \frac{\partial B}{\partial g_{net}} = \left[ \begin{array}{ccc} c_A^d & - & - \\ \frac{\partial c_A^d}{\partial g_{net}} & \frac{\partial c_B}{\partial g_{net}} & \frac{\partial T}{\partial g_{net}} \end{array} \right] + \left[ \begin{array}{ccc} c_A^s & - & - \\ \frac{\partial c_A^s}{\partial g_{net}} & \frac{\partial c_B}{\partial g_{net}} & \frac{\partial T}{\partial g_{net}} \end{array} \right] < 0 \]

For the impact of changes in \( \alpha \) we have:

\[ \frac{E_{gds}}{\partial \alpha} \geq \left[ \begin{array}{c} \frac{\partial k_A^d}{\partial \alpha} + \frac{\partial k_B^d}{\partial \alpha} - \frac{\partial c_A^s}{\partial \alpha} - \frac{\partial c_B^s}{\partial \alpha} - \frac{\partial k_A^s}{\partial \alpha} - \frac{\partial k_B^s}{\partial \alpha} \end{array} \right] < 0 \]

and:

\[ \frac{\partial B}{\partial \alpha} = \left[ \begin{array}{c} \frac{\partial k_A^d}{\partial \alpha} + \frac{\partial k_B^d}{\partial \alpha} - \frac{\partial k_A^s}{\partial \alpha} - \frac{\partial k_B^s}{\partial \alpha} - \frac{\partial c_A^s}{\partial \alpha} - \frac{\partial c_B^s}{\partial \alpha} \end{array} \right] > 0 \]

where the signs of all partials are determined in Appendices B and C.

It is important now to consider the potential exogeneity of exports. We have assumed that the hypothetical MCPE could sell all domestic excess supply on world markets at current world market prices. If this is the case then:
\[
\frac{\partial E^d_{gds}}{\partial \alpha} = \frac{\partial B}{\partial \alpha} \quad \text{and} \quad \frac{\partial E^d_{gds}}{\partial G_{net}} = \frac{\partial B}{\partial G_{net}}
\]

and the economy would always be in equilibrium in the expenditures sector. However, if any part of exports are a function of factors exogenous to the model (such as national income in foreign countries, as usually assumed) then the level of exports is not completely endogenous. As a result:

\[
\frac{\partial B}{\partial G_{net}} < \frac{\partial E^d_{gds}}{\partial G_{net}} \quad \text{and}
\]

\[
\frac{\partial B}{\partial \alpha} < \frac{\partial E^d_{gds}}{\partial G_{net}}
\]

(In fact if all goods are exported (there are no imports), and exports are completely exogenous then:

\[
\frac{\partial B}{\partial G_{net}} = \frac{\partial B}{\partial \alpha} = 0.
\]

Thus, in general, both the numerator of equation (426) and the denominator are positive. As a result the IBE curve is positively sloped in \( \alpha, G_{net} \) space and, as explained in the text, above the IBE curve there is excess supply of goods, below the IBE curve there is excess demand for goods.

Internal balance in the monetary sector requires the equality of the flow demand and supply of money balances. That is,
\[(427) \quad e^S(\varepsilon_{net}) = ma^d(\alpha, \varepsilon_{net}) = 0\]

We have then by implicit differentiation:

\[(428) \quad \frac{\partial \alpha}{\partial \varepsilon_{net}}_{IBM} = \frac{-\left[\frac{\partial e^S}{\partial \varepsilon_{net}} - \frac{\partial ma^d}{\partial \varepsilon_{net}}\right]}{\left[\frac{\partial e^S}{\partial \alpha} - \frac{\partial ma^d}{\partial \alpha}\right]} < 0\]

where \(\frac{\partial e^S}{\partial \varepsilon_{net}} > 0\), \(\frac{\partial e^S}{\partial \alpha} = 0\), \(\frac{\partial ma^d}{\partial \varepsilon_{net}} < 0\), and \(\frac{\partial ma^d}{\partial \alpha} < 0\) as determined in Appendices B and C. Assuming, as earlier, that out of any increase in taxes (or subsidies) on households (to enterprises) some proportion will be spent and some will be held as money balances, then

\[\left|\frac{\partial e^S}{\partial \varepsilon_{net}}\right| > \left|\frac{\partial ma^d}{\partial \varepsilon_{net}}\right| \cdot\]

Therefore, the numerator in equation (428) is negative and the denominator is positive. The internal balance curve for the monetary sector (the IBM curve), then is downward sloping in \(\alpha, \varepsilon_{net}\) space, and as explained in the text, above the curve we have excess supply of money balances (inflationary pressure or incipient inflation), below the curve we have excess demand for money balances (deflationary pressures).
External balance is defined as a zero devise balance of trade:

\[ B'(a, R, \varepsilon_{net}, P_A) = 0 \text{ or } \]

\[ (429) \quad \Pi(P_A, R) - B(a, R, \varepsilon_{net}, P_A) = 0 \]

We have from above,

\[ \frac{dB}{\partial a} = \frac{\partial k^d_A}{\partial a} + \frac{\partial k^d_B}{\partial a} - \frac{\partial c^s_A}{\partial a} - \frac{\partial c^s_B}{\partial a} - \frac{\partial k^s_A}{\partial a} - \frac{\partial k^s_B}{\partial a} > 0 \]

and

\[ \frac{dB}{\partial \varepsilon_{net}} = - \left[ \frac{\partial c^d_A}{\partial \varepsilon_{net}} \frac{\partial \Omega}{\partial \varepsilon_{net}} \frac{\partial T}{\partial \varepsilon_{net}} \right] + \left[ \frac{\partial c^d_B}{\partial \varepsilon_{net}} \frac{\partial \Omega}{\partial \varepsilon_{net}} \frac{\partial T}{\partial \varepsilon_{net}} \right] > 0 \]

And therefore implicit differentiation of equation yields:

\[ (430) \quad \frac{\partial a}{\partial \varepsilon_{net}} \bigg|_{EB} = \frac{(-1)}{\frac{\partial \varepsilon_{net}}{\partial B} - \frac{\partial B}{\partial \varepsilon_{net}}} > 0 \]

The slope of equation (429), the external balance curve (EB curve), then is positive and as explained in the text, above the curve there is a surplus in the balance of trade and below the curve there is a deficit in the balance of trade.
If the central planners act with knowledge of the impact of $d\alpha$ and $dg_{\text{net}}$ in an attempt to move the economy to the general equilibrium position depicted by point $A$, in Figure 22 of Chapter 6, there may be stability problems depending upon: (1) the relative slopes of the EB and IBE loci, and (2) the assignment of instruments ($\alpha$, $g_{\text{net}}$) to targets (internal balance, monetary or expenditures, and external balance).

Let us consider as a first case the situation depicted in Figure 23 below: the slope of the IBE curve is greater than the EB curve. If the internal balance target is price stability (a return to the IBM locus), then the planners' actions and continuous readjustment of $\alpha$ and $g_{\text{net}}$ would bring the system to point $A$ regardless of the assignment of instruments to targets. If $g_{\text{net}}$ is used for internal balance purposes and $\alpha$ is used for external balance purposes the system converges directly as indicated by the solid arrows. If $g_{\text{net}}$ is used for internal balance and $\alpha$ is used for external balance then the system converges with overshooting.

Alternatively if prices are fixed and the internal balance target is equilibrium in the expenditures sector we have potential instability depending upon the choice of instruments for the targets. Figure 24 illustrates that if $\alpha$ is the instrument assigned to external balance and
$g_{\text{net}}$ is the instrument assigned to internal balance, the system converges but with overshooting as indicated by the solid lines. However if $\alpha$ is assigned to the internal balance target and $g_{\text{net}}$ the external balance target then the system is unstable as indicated by the dotted arrows.

The second case, in which the slope of the IBE curve is less than the slope of the EB curve is illustrated in Figures 25 and 26. A similar problem arises with respect to stability. If we assume the internal balance target is price stability (a movement to the IBM curve), the system is
stable regardless of the assignment of instruments. Again if \( \alpha \) is assigned to the external balance target and \( \varepsilon_{\text{net}} \) to the internal balance target then there is direct convergence to point \( A \), as the solid arrows in Figure 25 indicate. If \( \alpha \) is assigned to the internal balance target and \( \varepsilon_{\text{net}} \) is assigned to the external balance target there is convergence with overshooting as indicated by the dotted arrows in Figure 25.

If the internal balance target is zero excess demand for goods, a movement toward the IBE curve, if there is
imbalance, then there is potential instability as in the first case above. If \( \alpha \) is assigned to the internal balance target and \( g_{\text{net}} \) to the external balance target, the system converges directly as indicated by the solid arrows in Figure 26. However, if \( \alpha \) is assigned to the external balance target and \( g_{\text{net}} \) is assigned to the internal balance target the system is unstable as indicated by the dotted arrows in Figure 26.

In the text we consider only the case in which the slope of the IBE curve is greater than the slope of the EB curve.
Figure 26. Internal-External Balance,
Slope EB > Slope IBE

(We get similar results with respect to the disturbances considered in the text for the case in which the slope of the EB curve is greater than the slope of the IBE curve.) Further we assume that central planners assign instruments to targets to ensure stability since there are no natural market forces which cause the changes in α and $g_{net}$. There is, of course, no guarantee that central planners do this.
APPENDIX H

An Empirical Specification of the Model
The model outlined in section 7.3 may be written in a linear form as a first attempt at estimation. In the equations below all variables are as defined in the text and \( \varepsilon \) is a normally distributed error term. The equations of the model then take the following form:

\[
(431) \quad c_A^d = (\beta_{1,0} + \frac{\beta_{1,3}}{\lambda_B}) + \beta_{1,1} \frac{w}{p} + (\beta_{1,2} - \frac{\lambda_A}{\lambda_B} \beta_{1,3}) \frac{p_A}{p} + \beta_{1,8} \frac{\Omega}{p} + \beta_{1,13} \varepsilon_p + \varepsilon_1
\]

\[
(432) \quad c_B^d = (\beta_{2,0} + \frac{\beta_{2,3}}{\lambda_B}) + \beta_{2,1} \frac{w}{p} + (\beta_{2,2} - \frac{\lambda_A}{\lambda_B} \beta_{2,3}) \frac{p_A}{p} + \beta_{2,8} \frac{\Omega}{p} + \beta_{2,9} \bar{c}_A + \beta_{2,13} \varepsilon_p + \varepsilon_2
\]

\[
(433) \quad \kappa_A^s = (\beta_{3,0} + \frac{\beta_{3,5}}{\partial_B}) + \beta_{3,1} \frac{w}{p} + (\beta_{3,4} - \frac{\partial_A}{\partial_B} \beta_{3,5}) \frac{w_A}{w} + \beta_{3,8} \frac{\Omega}{p} + \beta_{3,9} \bar{c}_A + \beta_{3,13} \varepsilon_p + \varepsilon_3
\]

\[
(434) \quad \kappa_B^s = (\beta_{4,0} + \frac{\beta_{4,5}}{\partial_B}) + \beta_{4,1} \frac{w}{p} + (\beta_{4,4} - \frac{\partial_A}{\partial_B} \beta_{4,5}) \frac{w_A}{w} + \beta_{4,8} \frac{\Omega}{p} + \beta_{4,9} \bar{c}_A + \beta_{4,13} \varepsilon_p + \varepsilon_4
\]
(435) \[ \Omega = \sum_{t=0}^{n-1} (w_A l_A^s + w_B l_B^s + b - T - P_A c_A^d - P_B c_B^d) \]

\[ \frac{P_B}{P} = \frac{1}{\lambda_B} - \frac{\lambda_A}{\lambda_B} \cdot \frac{P_A}{P} \]

\[ \frac{w_B}{w} = \frac{1}{\sigma_B} - \frac{\sigma_A}{\sigma_B} \cdot \frac{w_A}{w} \]

(438) \[ c_A^s = (\beta_{5,0} + \frac{\beta_{5,3}}{\lambda_B} + \frac{\beta_{5,5}}{\sigma_B} + \frac{\beta_{5,7}}{\mu_B}) + (\beta_{5,2} - \frac{\lambda_A}{\lambda_B} \beta_{5,3}) \frac{P_A}{P} \]

\[ + (\beta_{5,4} - \frac{\sigma_A}{\sigma_B} \beta_{5,5}) \frac{w_A}{w} + (\beta_{5,6} - \frac{\mu_A}{\mu_B} \beta_{5,7}) \frac{r_A}{r} + \beta_{5,10} K_A \]

\[ + \beta_{5,11} \bar{x}_A + \beta_{5,12} \bar{x}_B + \beta_{5,14} \alpha_A + \beta_{5,15} \gamma_A + \zeta_5 \]

(439) \[ c_B^s = (\beta_{6,0} + \frac{\beta_{6,3}}{\lambda_B} + \frac{\beta_{6,5}}{\sigma_B} + \frac{\beta_{6,7}}{\mu_B}) + (\beta_{6,2} - \frac{\lambda_A}{\lambda_B} \beta_{6,3}) \frac{P_A}{P} \]

\[ + (\beta_{6,4} - \frac{\sigma_A}{\sigma_B} \beta_{6,5}) \frac{w_A}{w} + (\beta_{6,6} - \frac{\mu_A}{\mu_B} \beta_{6,7}) \frac{r_A}{r} + \beta_{6,10} K_A \]

\[ + \beta_{6,11} \bar{x}_A + \beta_{6,12} \bar{x}_B + \beta_{6,16} \alpha_B + \beta_{6,17} \gamma_B + \zeta_6 \]
\[ (440) \quad k_A^s = (\beta_{7,0} + \frac{\beta_{7,3}}{\lambda_B} + \frac{\beta_{7,5}}{\delta_B} + \frac{\beta_{7,7}}{\mu_B}) + (\beta_{7,2} - \frac{\lambda_A}{\lambda_B} \beta_{7,3}) \frac{r_A}{r} \]

\[ + (\beta_{7,4} - \frac{\partial_A}{\delta_B} \beta_{7,5}) \frac{w_A}{w} + (\beta_{7,6} - \frac{\mu_A}{\mu_B} \beta_{7,7}) \frac{r_A}{r} \]

\[ + \beta_{7,10} \overline{K}_A + \beta_{7,11} \overline{K}_A + \beta_{7,12} \overline{K}_B + \beta_{7,14} \alpha_A + \beta_{7,15} \xi_{s} + \zeta_{7} \]

\[ (441) \quad k_B^s = (\beta_{8,0} + \frac{\beta_{8,3}}{\lambda_B} + \frac{\beta_{8,5}}{\delta_B} + \frac{\beta_{8,7}}{\mu_B}) + (\beta_{8,2} - \frac{\lambda_A}{\lambda_B} \beta_{8,3}) \frac{r_A}{r} \]

\[ + (\beta_{8,4} - \frac{\partial_A}{\delta_B} \beta_{8,5}) \frac{w_A}{w} + (\beta_{8,6} - \frac{\mu_A}{\mu_B} \beta_{8,7}) \frac{r_A}{r} + \beta_{8,10} \overline{K}_A \]

\[ + \beta_{8,11} \overline{K}_A + \beta_{8,12} \overline{K}_B + \beta_{8,16} \alpha_B + \beta_{8,17} \xi_{s} + \zeta_{8} \]

\[ (442) \quad \lambda_A^d = (\beta_{9,0} + \frac{\beta_{9,3}}{\lambda_B} + \frac{\beta_{9,5}}{\delta_B} + \frac{\beta_{9,7}}{\mu_B}) + (\beta_{9,2} - \frac{\lambda_A}{\lambda_B} \beta_{9,3}) \frac{r_A}{r} \]

\[ + (\beta_{9,4} - \frac{\partial_A}{\delta_B} \beta_{9,5}) \frac{w_A}{w} + (\beta_{9,6} - \frac{\mu_A}{\mu_B} \beta_{9,7}) \frac{r_A}{r} \]

\[ + \beta_{9,10} \overline{K}_A + \beta_{9,14} \alpha_A + \beta_{9,15} \xi_{s} + \zeta_{9} \]

\[ (443) \quad \lambda_B^d = (\beta_{10,0} + \frac{\beta_{10,3}}{\lambda_B} + \frac{\beta_{10,5}}{\delta_B} + \frac{\beta_{10,7}}{\mu_B}) + (\beta_{10,2} - \frac{\lambda_A}{\lambda_B} \beta_{10,3}) \frac{r_A}{r} \]

\[ + (\beta_{10,4} - \frac{\partial_A}{\delta_B} \beta_{10,5}) \frac{w_A}{w} + (\beta_{10,6} - \frac{\mu_A}{\mu_B} \beta_{10,7}) \frac{r_A}{r} \]

\[ + \beta_{10,10} \overline{K}_A + \beta_{10,16} \alpha_B + \beta_{10,17} \xi_{s} + \zeta_{10} \]
\[ (444) \quad k_A^d = (\beta_{11,0} + \frac{\beta_{11,3}}{\lambda_B} + \frac{\beta_{11,5}}{\alpha_B} + \frac{\beta_{11,7}}{\mu_B}) + (\beta_{11,2} - \frac{\lambda_B}{\mu_B} \beta_{11,3}) \frac{P_A}{P} \\
\quad + (\beta_{11,4} - \frac{\partial}{\partial_B} \beta_{11,5}) \frac{w_A}{w} + (\beta_{11,6} - \frac{\mu_A}{\mu_B} \beta_{11,7}) \frac{r_A}{r} \\
\quad + \beta_{11,11} \bar{A} + \beta_{11,12} \bar{B} + \beta_{11,14} \bar{A} + \beta_{11,15} \bar{A}^A + \beta_{11,16} \bar{A}^B + \beta_{11,17} \bar{A}^C + \beta_{11,18} \bar{A}^D \\
\]

\[ (445) \quad k_B^d = (\beta_{12,0} + \frac{\beta_{12,3}}{\lambda_B} + \frac{\beta_{12,5}}{\alpha_B} + \frac{\beta_{12,7}}{\mu_B}) + (\beta_{12,2} - \frac{\lambda_B}{\mu_B} \beta_{12,3}) \frac{P_A}{P} \\
\quad + (\beta_{12,4} - \frac{\partial}{\partial_B} \beta_{12,5}) \frac{w_A}{w} + (\beta_{12,6} - \frac{\mu_A}{\mu_B} \beta_{12,7}) \frac{r_A}{r} \\
\quad + \beta_{12,11} \bar{A} + \beta_{12,12} \bar{B} + \beta_{12,14} \bar{A} + \beta_{12,16} \bar{A}^B + \beta_{12,17} \bar{A}^C + \beta_{12,18} \bar{A}^D \\
\]

\[ (446) \quad E = \sum_{t=0}^{n-1} \left( \frac{P_A c_A^s + P_B c_B^s + r_A k_A^s + r_B k_B^d}{w_A} \frac{l_A^d - w_B} - w_B l_B^d \right) \\
\quad - r_A k_A^d - r_B k_B^d - b + g_s \)

\[ (447) \quad \frac{r_B}{r} = 1 - \frac{\mu_A}{\mu_B} \cdot \frac{r_A}{r} \\
\]

\[ (448)-(449) \quad \ell_i^s = \ell_i^d \]

\[ (450)-(451) \quad c_i^s = c_i^d \quad i = A, B \]

\[ (452)-(453) \quad k_i^s = k_i^d \]

\[ (454) \quad e^s = m a^d \]

\[ (455) \quad B = P_A(c_A^s - c_A^d - g_{c_A}) + P_B(c_B^s - c_B^d - g_{c_B}) \\
\quad + r_A(k_A^s - k_A^d - g_{k_A}) + r_B(k_B^s - k_B^d - g_{k_B}) \]
In this specification there are twenty-five equations, twelve of which are to be estimated ((431)-(434), (438)-(445)) and the remainder being identities ((435)-(437), (447)-(455)). There are seventeen endogenous variables $c_A, c_B, l_A, l_A, c_A, c_B, k_A, k_B, l_B, k_A, k_B$ (determined by the twelve equations to be estimated) and

$$\frac{w}{P}, \frac{w_A}{w}, \frac{r_A}{r}, \frac{P_A}{P}, \frac{\Omega}{P}$$ (determined by five of the identities).

There are nine exogenous or predetermined variables $\xi_P, \alpha_A, \alpha_B, \xi_A, \xi_B, k_A, k_B, c_A$.

(Note that $\Omega, w_A, w_B, r_A$, and $P_A$ are exogenous, or policy variables, but that $P, w$, and $r$ are not. Therefore the ratios are endogenous.) We have substituted for $P_B, r_B$ and $w_B$ in the model above using equations (436), (437), and (447) to avoid problems of multicollinearity. Table 28 indicates the coefficient of each right hand side variable and coefficient i,1 through i,8 indicate endogenous variables while coefficients i,0 and i,9 through i,17 indicate the constant and exogenous variables. Table 29 considers the identification status of each equation to be estimated and as indicated each equation is overidentified.
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<th>Variable</th>
<th>Coefficient</th>
<th>Variable</th>
<th>Coefficient</th>
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<td>$\frac{\Omega}{p}$</td>
<td>$\beta_{1,8}$</td>
<td>$g_s$</td>
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Table 29
Identification Status of the Model

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<th>Identification Status</th>
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<td>$c^d_A$</td>
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</tr>
<tr>
<td>$c^d_B$</td>
<td>9 - 3 = 6 &gt; 4 - 1 = 3</td>
<td></td>
<td>over</td>
</tr>
<tr>
<td>$l^s_A$</td>
<td>9 - 3 = 6 &gt; 1 - 1 = 3</td>
<td></td>
<td>over</td>
</tr>
<tr>
<td>$l^s_B$</td>
<td>9 - 3 = 6 &gt; 4 - 1 = 3</td>
<td></td>
<td>over</td>
</tr>
<tr>
<td>$s^d_A$</td>
<td>9 - 5 = 4 &gt; 4 - 1 = 3</td>
<td></td>
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</tr>
<tr>
<td>$s^d_B$</td>
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<td></td>
<td>over</td>
</tr>
<tr>
<td>$k^s_A$</td>
<td>9 - 5 = 4 &gt; 4 - 1 = 3</td>
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<td>over</td>
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<tr>
<td>$k^s_B$</td>
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<tr>
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