A STUDY OF THE RELATIONSHIPS BETWEEN MONEY, FINANCIAL MARKETS AND ECONOMIC GROWTH

by

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A B S T R A C T

This study is concerned with the causal relationship between money, finance and growth. In the first chapter, some of the empirical research on the subject is discussed. It establishes evidence of a positive dependence between real and financial growth. The findings do not, however, explain the direction of causality. In the second and third chapters, the cause-effect relationship is therefore analyzed in theoretical terms. The theory is based on a barter system into which money, and subsequently direct and indirect financial markets, are introduced. The objective is to determine whether these innovations are likely to induce increases in the equilibrium growth rate of an economy. If either or both increase growth it follows that money and/or finance is causal. At the same time, these markets would acquire great practical significance for the development process.

The analysis refutes the hypothesis of causality from money and financial markets to growth. Neither steady state growth rates can be shown to increase, nor savings rates. The sole significant effect of both innovations appears to be a rise in income-per-capita levels but not in their rates of growth.

The concluding chapter uses the results of the theory for deriving policy recommendations for Thailand. At first, policy objectives are defined and their implications for the optimal savings ratio. Actual Thai data are then compared with the optimum condition and it is found that past performance may satisfy long-term savings objectives.

The study concludes by estimating the relative size of output, due to inefficiency in the present structure and performance of the financial sector in Thailand. Existing inefficiencies are shown to be significant, thus necessitating policy changes.

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CHAPTER I

EMPIRICAL EVIDENCE ON FINANCE AND GROWTH

A. Introduction

Economic growth appears to be the declared objective of all nations and particularly of the less developed countries. Per capita income growth requires capital accumulation which in turn depends upon the level and rate of savings. Investment and savings are thus strategic variables in the process of development to higher income levels.

The present study focuses on those economic factors which connect the borrowing and lending sides of the saving-investment sector: money and the financial system. The objective of this paper is to determine the importance of these markets in the growth process. Money and finance acquire theoretical and practical significance if one or both of the following functions is achieved by the financial sector:

1. A permanent rise in the savings rate.
2. An improvement in the efficiency of the allocation of resources given the level of savings.

At first, some directly pertinent empirical research is reviewed and evaluated in terms of the above two propositions. Initially, it was hoped to obtain some indication as to the direction of causality between finance and growth. However, the results of these international studies proved inconclusive and made it thus impossible to base subsequent work on the empirical findings. In a negative way, they prescribed the analy-

tical structure for the main part of this paper. It became obvious that a theory about the relationship between finance and growth should most appropriately be initiated by an analysis of a non-monetized economy. By introducing money and financial intermediaries stepwise into the barter system, the economic effects of both changes can be analyzed most clearly. In addition, this approach seems to yield the identification of the crucial factors determining the causal nature in the process of real and financial growth.

B. Review of Literature

There obviously exists some relationship between a country's financial structure and its stage of economic growth. Any definition of a stage in the development of a country's economy mentions money, capital markets, and financial institutions. Generally, more complex financial markets are associated with "higher" stages of growth, although this association is neither clear nor unambiguous. It avoids a rigorous definition of both financial structures and economic growth which is a precondition for any analysis of the mutual interrelationship.

The central problem is, therefore, not so much whether a relationship between finance and growth exists, but how these two variables affect each other. In functional form, the problem can be expressed as the following alternatives:

$$(a)\quad Y^{*} = f[K(t), L(t), A(t)]$$

$$(b)\quad F(t) = g[(Y/L)(t), Y^{*}]$$

$$(c)\quad S(t) = h[Y/L(t)] \text{ with } h = \text{const.}$$

$$(a') \qquad Y^{*}{}' = f'[F(t), K(t), L(t), A(t)]$$

$$(b') \qquad (Y/L)(t) = g'[F(t), F^{*}, K(t), L(t), A(t)]$$

$$(c') \qquad (S/Y)(t) = h'[F(t)]$$

where

$$Y^{*} = \frac{dY(t)}{dL(t)} \cdot \frac{L(t)}{Y(t)};$$

$$F^{*} = \frac{dF(t)}{F(t)};$$

Y = total output;

K = capital stock;

L = labor force;

F = size and complexity of the financial system in relation to national wealth;[1]

A = exogenous technical progress factor;

S = aggr. savings.

The first formulation assumes that the size and the growth of financial markets depend upon the rate of growth of output and its absolute level and that savings are a constant ratio of income per capita. The second reverses the direction of causality: financial markets are assumed to

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[1] How this should be measured need not concern us here.

represent catalysts in the process of development, determining significantly the rate of growth of output and inducing increases in the rates of saving.

This paper attempts to identify those economic factors which allow us to explain the cause-effect relationship. Should the analysis in this and the following chapters show that the financial structure merely presents a mirror image of a level of economic development already reached (equations a, b and c) financial policies could be classified as of secondary importance for raising rates of income growth. If, on the other hand, financial institutions appear to be more appropriately explained as factors determining growth over time (equations a', b' and c') the formulation of optimal financial policies would acquire great operational significance. *A priori*, it can be said, that a simple answer for one or the other alternative should not be expected. The problem is too complex to be comprehensively dealt with in a relatively short paper like this.

To gain some first insight into the causal nature of the relationship between financial markets and growth we can briefly review the findings of three studies on the subject, by Goldsmith,[2] Adelman and Taft-Morris,[3] and a United Nations report.[4]

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[2]R. W. Goldsmith, "The Determinants of Financial Structure," *Organization for Economic Cooperation and Development (O.E.C.D.)*, Study No. 2, (1965).

[3]I. Adelman and C. Taft-Morris, *Society, Politics and Economic Development* (Baltimore: The Johns Hopkins Press, 1967).

[4]United Nations, *Economic Bulletin for Asia and the Far East* (December 1962), pp. 1-15; results reprinted in A. A. Rozenthal, "Unorganized Financial Markets and Development Strategy," *Journal of Developing Areas*, Vol. I (July 1967).

The Goldsmith study is concerned with the determinants of financial structure. The author tries to measure the relation between the value and the change of total financial assets and national wealth.[5] The Goldsmith data show that during economic development, countries usually experience more rapid growth in financial assets than in national wealth or national product. In other words, the elasticity of demand for financial assets was found to exceed unity for income and wealth. National stocks of financial assets varied from 10 to more than 200 per cent of national real wealth. The countries with the lowest per capita income generally also had very low ratios of financial to real wealth, with the values between 10 and 15 per cent. For countries with higher income per capital levels, the ratio ranged from 30 to 60 per cent, whereas the ratios for industrialized nations such as France, West Germany, the United States, and Canada were 80 to 100 per cent. The highest ratios were found for Japan (150 per cent), Switzerland (200 per cent), and the United Kingdom (215 per cent).[6] For the Soviet Union this ratio amounted to only 35 per cent. This last figure indicates that although differences in income per capita account for parts of the varying levels of financial wealth ratios, the form of economic and political organization in any

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[5] His FIR or "financial interrelations ratio" is a composite of several determinants which include gross national product, a monetization ratio, a capital formation ratio, the ratio of new issues of non-financial units to their capital formation, the ratio of new issues of financial instruments by financial institutions to new issues by non-financial units, the ratio of total issues of financial instruments to the issues of non-financial units, and others.

[6] Goldsmith, *op. cit.*, p. 2.

country also plays a major role, i.e., the degree to which a government chooses to limit or to encourage financial intermediation.

There are basically two different techniques for mobilizing savings for capital accumulation: processes of internal finance and of external finance. In the former, investors draw on their own savings, in the latter they use savings of others. The methods of self-finance, where savings are channeled to investors by adjustments in relative prices in commodity and factor markets and/or in markets for foreign exchange, belong to the category of internal finance processes. Furthermore, the technique of financing development through taxation or inflation represent internal finance methods. All these non-market methods are excluded from the subsequent discussion. We concentrate on the process of external finance and its relationship to development. Along with foreign aid, the debt-asset system constitutes the principal method of external finance. Since aid is largely outside the control of domestic policy makers in the development countries, we also exclude it. Our concern is directed to market economies which rely on decentralized decision making. In other words, by discussing the debt-asset system of indirect finance we hope to find out whether and how a financial system influences the other sector in a growing economy. Given this objective we can disregard empirical data like that for the Soviet Union because it obviously does not belong into the context of a market economy. In general, the Goldsmith study shows a positive and increasing ratio between financial development and real growth for market type economies, thus supporting our hypothesis (a), (b) and (c) above. It is not obvious, however, whether the observed

correlations reflect merely higher levels of income or whether the process of asset accumulation, by itself, contributed to the attainment of these higher per capita incomes.

The second study by Adelman and Taft-Morris, entitled *Society, Politics and Economic Development,*[7] focuses more on the dynamic properties of financial systems and seems, therefore, better suited to provide an explanation to the problem. To measure the effectiveness of financial institutions, two indicators are selected to represent the long run level and the short term improvement in the effectiveness of the financial system.[8] In each case a composite variable is constructed to show the success of financial intermediaries in attracting private savings and the extent to which they provide medium and long term credit in the major sectors of the economy.

The following tables are based on the Adelman and Taft-Morris findings for the two financial indices, "effectiveness" and "improvement of financial system." The authors divided the 73 nations studied into three categories: A, B, and C. Those countries in which financial institutions

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[7]Adelman and Taft-Morris, *op. cit.*, pp. 120-27.

[8]The first index of long run improvement in the effectiveness of the financial system includes two variables, for which there are direct estimates: the flow of internal savings through a country's financial system, measured by the gross domestic savings ratio, and the ratio of the sum of time and demand deposits by money to GNP. A third, theoretically important element is added in the form of an estimate of the flow of capital from the banking system into medium and long term investment. Unfortunately, there is too little reliable statistical information to attribute much weight on this variable. The second index measures the improvement in financial institutions and is based on the increase in the volume of private savings through the banking system and the volume of lending by banks to the private sector.

are at least "moderately effective" were classified under A. As prerequisite for qualifying in this A group countries needed to have both the ratio of time and demand deposits plus money exceed 30 per cent. Furthermore, the gross savings ratio had to be greater than 13 per cent for A-countries. In the B group, financial institutions are defined to play a smaller but not insignificant role, while in the countries under C financial intermediaries attract only a negligible volume of domestic private savings. Domestic availability of credit is minimal. The second index measuring the improvement in financial institutions, is again subdivided into three groups: marked - moderate - no significant improvement. Substantial improvement was defined as either an increase of more than five per cent in the ratio of time and demand deposits in relation to gross national product, or a more than five-fold increase in the real value of private domestic liabilities to the banking system for the period 1950-1961. We supplemented the Adelman-Taft-Morris findings by data on the level of income per capita and its rate of growth for all the countries in their sample. Since these countries broadly belong to the class of market economies, the results should be indicative for our investigation.

TABLE I-1

RELATIONSHIP BETWEEN THE EFFECTIVENESS OF FINANCIAL INSTITUTIONS, GNP PER CAPITA, AND THE RATES OF GROWTH OF GNP FOR 73 SELECTED COUNTRIES

(1950 - 1964)

LIST OF COUNTRIES GROUPED ACCORDING TO THE LEVEL OF EFFECTIVENESS OF FINANCIAL INSTITUTIONS	GNP PER CAPITA (1964)	RATES OF GROWTH OF GNP (1960-64)	(1950-64)	IMPROVEMENT INDEX IN FINANCIAL INSTITUTIONS (1950/51 - 1962/63)
GROUP A				
Argentina	780	2.0	2.9	marked
Brazil	240	4.3	5.6	some
Greece	660	8.5	6.4	marked
Israel	1,160	10.8	10.2	marked
Jamaica	460	4.7	7.3	some
Japan	860	9.0	7.3	marked
Lebanon	480	8.5	5.2	some
Mexico	470	6.2	5.9	some
South Africa	550	4.2	6.2	marked
Trinidad	630	6.8	8.9	marked
Venezuela	850	5.0	6.6	marked
GROUP B				
Algeria	220	1.6	6.1	none
Ceylon	150	2.9	3.4	marked
Chile	510	3.5	3.5	some
Columbia	280	4.8	4.6	some
Costa Rica	400	4.6	4.8	some
Cyprus	690	2.6	4.0	marked
Ecuador	190	4.0	4.5	some
El Salvador	270	12.1	6.8	some
Ghana	230	3.7	4.0	none
India	90	4.4	3.7	marked
Iran	250	3.8	4.8	marked
Iraq	270	6.2	9.4	some
Ivory Coast	220	4.5	4.8	some
Jordan	220	11.2	8.2	marked
Kenya	90	4.3	5.0	none
Marocco	170	3.4	2.2	some
Nicaragua	330	10.1	6.4	marked
Nigeria	80	4.5	4.0	some
Pakistan	90	5.4	3.5	marked
Panama	500	8.1	5.6	some

TABLE I-1 (Continued)

LIST OF COUNTRIES GROUPED ACCORDING TO THE LEVEL OF EFFECTIVENESS OF FINANCIAL INSTITUTIONS	GNP PER CAPITA (1964)	RATES OF GROWTH OF GNP (1960-64)	(1950-64)	IMPROVEMENT INDEX IN FINANCIAL INSTITUTIONS (1950/51 - 1962/63)
Peru	320	7.2	5.7	marked
Philippines	160	4.7	5.4	marked
Rhodesia	210	3.5	5.7	marked
Senegal	210	-	-	none
South Korea	150	5.6	6.1	marked
South Vietnam	120	5.0	3.5	some
Sudan	100	4.6	5.2	marked
Surinam	360	2.8	6.1	none
Syria	180	11.5	5.5	marked
Taiwan	230	8.2	7.4	marked
Thailand	130	6.9	6.3	marked
Tunisia	200	5.8	3.9	not shown
Turkey	280	4.0	4.6	marked
Uganda	100	3.3	3.7	none
United Arab Republic	160	6.4	5.6	not shown
Uruguay	510	.2	.7	none
GROUP C				
Afghanistan*	70	3.5	3.5	none
Bolivia	160	4.9	1.9	some
Cambodia	120	4.0	5.7	some
Cameroon	110	1.2	1.0	some
Chad	70	-	-	none
Dahomey*	80	1.3	1.5	none
Dominic. Republic	250	3.2	6.0	some
Ethiopia	60	3.7	4.1	none
Gabon*	400	4.0	-	none
Guatemala	320	6.1	4.4	marked
Guinea*	80	.1	.3	none
Honduras	220	4.3	3.7	marked
Indonesia*	100	4.8	4.3	none
Laos*	70	3.5	2.5	none

*No ready GNP per capita data were available and had to be computed from sources (4) and (5).

TABLE I-1 (Continued)

LIST OF COUNTRIES GROUPED ACCORDING TO THE LEVEL OF EFFECTIVENESS OF FINANCIAL INSTITUTIONS	GNP PER CAPITA (1964)	RATES OF GROWTH OF GNP (1960-64)	(1950-64)	IMPROVEMENT INDEX IN FINANCIAL INSTITUTIONS (1950/51 - 1962/63)
Liberia*	210	6.5	5.5	none
Malagasy*	80	.7	.5	none
Malawi	50	1.0	3.4	none
Nepal*	70	5.3	4.8	none
Niger*	80	-	-	none
Paraguay	200	3.5	3.0	none
Sierra Leone*	150	5.6	4.8	none
Somali Republic*	50	.5	.2	none
Tanganyika	90	3.3	3.2	some
Yemen*	90	6.1	5.8	none
Zambia	180	3.4	4.2	none

*No ready GNP per capita data were available and had to be computed from sources (4) and (5).

SOURCES:

[1]Adelman and Taft-Morris, *op. cit.*, pp. 118-120.

[2]Benjamin Higgins, *Economic Development*, Revised Edition (New York: W. W. Morton, 1968), pp. 506.

[3]*Finance and Development*, Vol. VI (March 1969), pp. 30-42.

[4]Worldmark, *Encyclopedia of Nations*, Vols. II and IV (New York, 1967).

[5]United Nations, *Statistical Yearbook* (New York, 1967).

The data reveal a generally close correspondence between the level of effectiveness of financial institutions and per capita income levels. In the case of the financial improvement index and income per capita the correlation is by far less clear. Seven out of 11 countries in the A-group with the relatively highest income levels per head show marked improvements in their financial systems, but only 16 out of 36 classified under B. The least number of "marked improvements" was found for Group C for merely two out of 26 countries. Taking into account that financial improvement depends not only on the levels of output but also on the rates of growth of the economy, these results are not very surprising.

One would expect that a rapid overall growth rate induces a high demand for financial intermediation, and that a statistical estimation of the correlation coefficients should give significant results for both financial indices and for the two growth rate series. However, our experimentation with different regression equations did not produce the anticipated good fit. A major reason could be attributed to the fact that the dependent variable in the estimation equation, namely the financial indices, could only be expressed in terms of a dummy variable for lack of numerical specification in the Adelman - Taft-Morris study. Another relevant factor which accounts partially for the unsatisfactory results may be the absence of an appropriate breakdown of national growth rates into sectoral rates. It is obvious that a great variance in rates among different industries causes a greater need for financial institutions to transfer funds from the slow

growing to the fast growing industries. Moreover, the sectoral distribution of saving and investment, the rate of inflation, and political and historical influences play a part but escape measurement. The Adelman and Taft-Morris study does, therefore, not greatly improve our understanding of the interrelationship between finance and growth. Their results confirm and extend the Goldsmith findings: nations with lowest per capita incomes appear to have the least efficient and improving financial structures. Whether this implies a direction of causality as in our formulation a', b', and c' above, i.e., from financial growth to real growth is still unclear.

The United Nations report which also deals with the cause-effect issue is more suggestive although again not conclusive.[9] In a number of ECAFE countries, savings rates were related to the composition in which these savings were held. Only two broad classes were examined: measurable holdings in real versus financial wealth.[10] The chart on the following page shows the results for the years 1954-59.

It indicates a relatively high degree of correlation between capital formation and financial growth. However, this information alone cannot demonstrate rigorously that a greater spread of financial institutions will lead to increases in savings rates and through this to rises in rates of output growth. It is quite possible, that the observed increase in the savings ratios partially reflects a reduction of household

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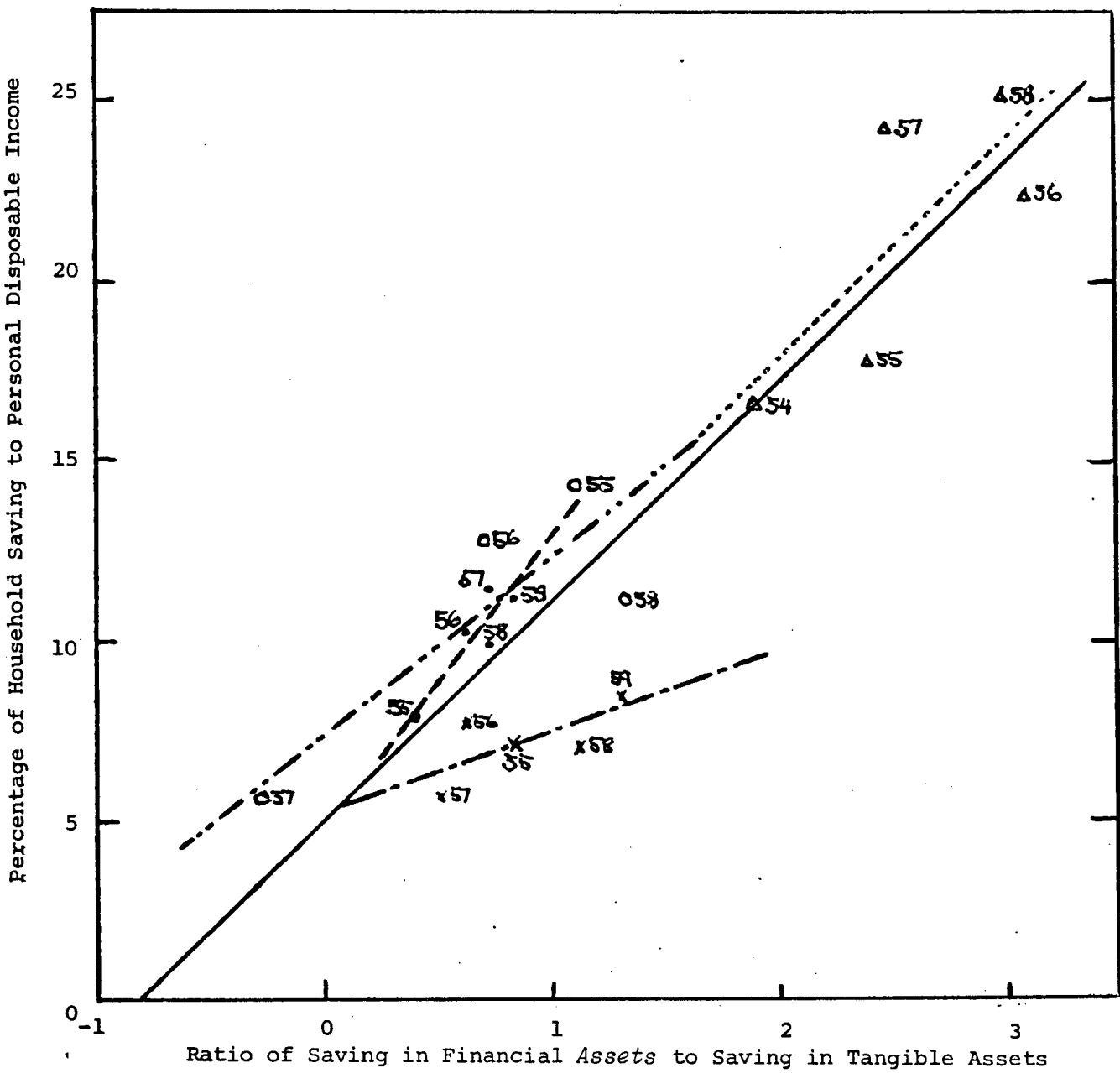
[9] United Nations, *op. cit.*, p. 9.

[10] The percentage of household savings is related to personal disposable income and compared to the ratio of saving in financial assets to tangible assets.

CHART I-1

RATE AND FORM OF HOUSEHOLD SAVINGS IN FOUR ECAFE COUNTRIES

(1954 - 1959)



Key:

Ceylon - X
Federation of Malaya - O
Japan - Δ
Philippines - ●
Four Countries

Source: United Nations, *op. cit.*, p. 9.

holdings of tangible assets. In other words, estimated savings rates in the beginning of the period studied may understate the propensity to save because of statistical measurement difficulties of tangible assets. With this hypothesis the lines of the diagram would have a lesser positive slope than those shown. For constant savings ratios they would, obviously, be parallel to the horizontal axis. Since we are not in a position to resolve this problem empirically, we shall discuss it further in Chapter III, where the theoretical effects of finance on output and growth are analyzed.

The explanatory value of the examined evidence was poor. We only obtained a confirmation of the *a priori* expectation that a positive relationship between financial and real development appears to exist. For the direction of causality, from finance to growth and the extent of the mutual interaction between all relevant factors, no satisfactory answer could be found. What is required, therefore, is a theory linking financial markets to the real variables of the system.

As already noted in the introduction, the best starting point for such a theoretical analysis is a barter economy. In our context of developing countries this choice is particularly relevant since elements of barter trade can still be observed in varying degrees in these nations. Indeed, one of the questions we hope to answer as a result of the following analysis is that the elimination of barter enclaves in otherwise monetized economies is likely to be economically more efficient than the retention of barter.

CHAPTER II

MONEY, FINANCE AND GROWTH

Preface*

The following two chapters are concerned with the theoretical importance of money and an efficient system of financial markets. Specifically, we attempt to show that:

1. The use of money increases efficiency in the resource allocation process. Income per capita will consequently rise to a new equilibrium level.

2. The emergence of financial markets represents a technological improvement over a simple state of monetization. It also increases the level of income per capita.

3. The steady state growth rates will not change due to either money and financial markets. The same holds for the savings rates after both innovations.

The easiest way to prove these propositions is by analyzing them separately. We therefore deal at first in Chapter II with the invention and implementation of a commodity money standard. An extension to a paper money system could then be easily added. It is omitted because none of the results from discussing a commodity money would change substantially.

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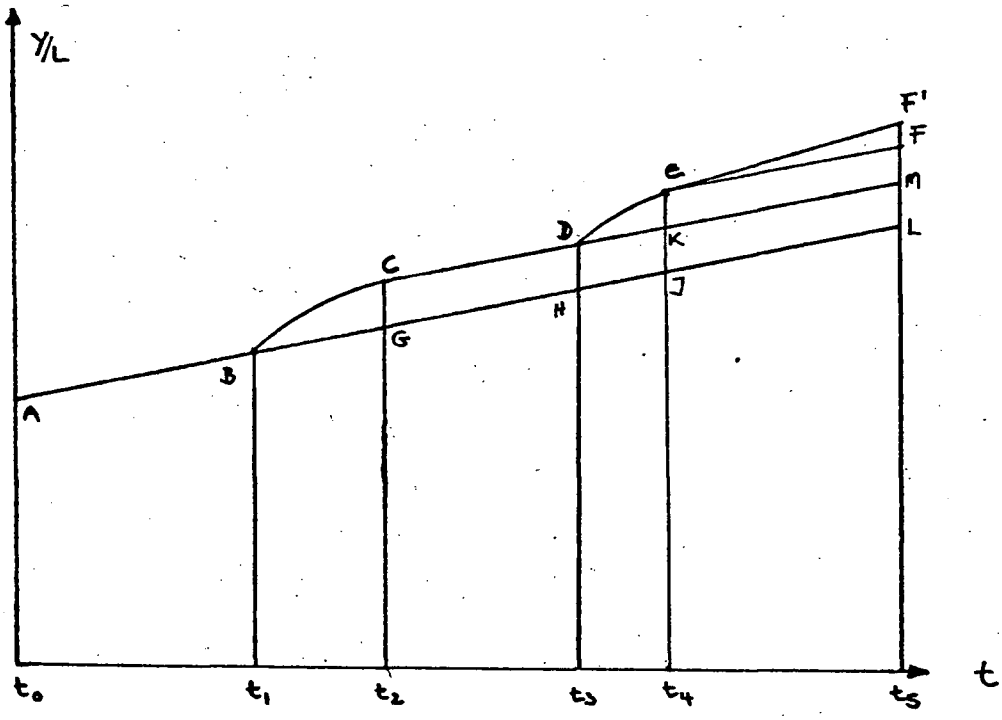
*This preface serves as an introduction for this chapter and also for Chapter III.

In Chapter III, the effects of the introduction of direct and indirect financial markets are analyzed. For expository convenience it will be assumed that both technological inventions occur separately at a specific point in time.

In Chapter II we are first concerned with the question of how and when an existing capital good will be selected to function as commodity money. Thereafter, the equilibrium conditions of this new money market are derived. This leads into a discussion of the optimality conditions for the money supply under a commodity money standard. The results of the money markets are then used and extended for analyzing the global effects of monetization on production and trade in a closed economy. After having established the comparative static equilibrium conditions, the dynamic effects of the change are considered. At last a section on the effects of monetization in an open economy is added.

The conclusions from the monetization stage of the model form the assumptions for the analysis of direct and indirect financial markets. Put differently, it will be assumed that an efficient financial system is superimposed on the already monetized economy. Chapter III then deals with the resulting initial disequilibrium and the convergence of the economy to a new steady state. It will be shown that financial markets are of particular importance for the saving-investment sector of an economy and that other economic effects can be explained as originating in this sector. Implicit in our way of analyzing the impact of money and finance is the objective to separate the two major functions of these markets: the administration of a means of payment and the provision of credit function.

Before starting the investigation, our hypotheses are repeated in diagrammatic form:



The diagram with time units on the horizontal axis, and the logarithms of total output per capita on the vertical axis, relates output growth rates to the incidence of the two financial changes. As mentioned, they are assumed to occur at the arbitrarily chosen point in time t_1 and t_3. From the linear segment of the curve AB it is obvious that the economy is assumed to grow at a constant equilibrium rate. At t_1, when money is introduced, the old equilibrium is disturbed. After the dynamic effects of the change have worked themselves out, segment BC, the economy is assumed to reach a new equilibrium growth path, CD. This assumption implies that the disequilibrium path is regarded as converging to a new steady state, or put differently, that money does not result in explosive or cyclical growth. We even go a step further by asserting that the value

of the equilibrium output growth rate will be identical to the situation prior to monetization, or CD and AB are parallel. The next disturbance occurs when indirect financing is superimposed on the money economy at t_3. The system will again go through a phase of dynamic adjustments, segment DE until a new equilibrium expansion rate is attained. It is frequently asserted that this latter steady state rate will be higher than the previous rates such as EF'. However, our conclusions will refute this proposition. It will be shown below, that the lowest possible and most likely value for the new equilibrium rates is the magnitude of the two previous steady state rates. Under certain conditions which will be specified, higher rates are attainable.

From the above figure, it is possible to measure the total increase in output for any period after the first and second financial change.[1] It could then be compared to the total output that would have prevailed in the absence of these two innovations. While this comparison can easily be made in a hypothetical graph, it would be extremely difficult to compute it for any real economy. The transition from barter to a monetized state and particularly the second move are accompanied by substantial changes in the whole structure of the economic system. To disentangle all the cause-effect relationships and attribute quantitative

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[1]The output per capita gain due to monetization for the time when a new equilibrium is attained is shown as GC. The total increase in aggregate income would then be GC times the population. The second gain due to indirect finance is shown at t_4 as EI compared to the barter state and as EK compared to the monetized state. For periods after t_4 there may be a cumulative further gain, equal to the difference between the new steady state rate and the old one such as FF' for t_5.

measures to them exceeds by far the scope of the present analysis. Our empirical part in Chapter IV is, therefore, restricted to the derivation of some partial quantitative indicators about the efficiency of financial markets in Thailand. Using *ceteris paribus* assumptions, we attempt to show how aggregate output could have increased in one year if financial markets were operated with maximum efficiency.

B. The Nature of the Barter Economy

At first, a monetary theory of our model country must be developed. To facilitate this the main characteristics of a barter system are summarized.

The productive structure of a barter economy is, almost by definition, very simple. As will be shown below, it is precisely the lack of money that prevents more sophisticated production and trade patterns. As to the form of organization, barter need not be identified only with a handicraft system where resource owners produce and sell the complete products. This assumption is often made or the even more restricted one of a Hicksian type of exchange economy. We shall not confine ourselves to such artificial states but work from the outset with a dynamic framework of an enterprise economy. In such an economy the services of the productive resources, capital and labor, are sold to entrepreneurs in return for their products. The income of individuals thus consists of that quantity of goods which they receive for their services. Exchange takes place -- domestically and internationally -- until all individuals have achieved maximum satisfaction, i.e., an optimum collection of goods given relative prices, initial resource endowment, incomes, tastes and the institutional framework.

In stable competitive equilibrium prices can be measured either in terms of one of the commodities or as in a Wicksellian pure credit economy in terms of an abstract unit of account. It follows, therefore, that only relative prices and accounting prices are defined; not, however, the absolute price level. It is a meaningless construct in this state. Relative prices are determined by supply and demand in the different markets. Accounting prices are fixed arbitrarily. They are not observable market phenomena and their value, thus, independent of market forces. Patinkin appropriately refers to the extraneous force which fixes the accounting price of one of the goods at the value of "one" as "deus ex machina."[2]

The existence of a barter economy implies Say's identity, i.e., that all excess demand functions will always precisely add up to zero. This applies obviously to both domestic as well as international transactions. By necessity goods are only sold to buy other commodities. The homogeneity postulate which is the logical equivalent to Say's identity also holds.

Overall economic policy as a regulatory device is therefore nonexistent and unnecessary, provided the proper distribution of income and wealth exists. Should it not, a simple redistribution scheme of taxes and subsidies could be instituted. We can thus picture the barter state as following a golden age path with minimal government intervention. Unemployment and cyclical business fluctuations would also be absent in such a state.

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[2]Don Patinkin, *Money, Interest and Prices*, Second Edition (New York: Harper and Row, 1965), p. 195.

However, this superficial picture is treacherous because bartering is costly. An economy relying on it suffers from serious frictions in its production and exchange, thus limiting the extent of possible specialization. The costs in terms of labor's time and specialized skills required for barter transactions will largely depend on the complexity of the production structure. The smaller and simpler the array of different goods produced and exchanged, the easier and less costly will generally be the transaction.

As a theoretical exercise, one could conceive a growth model for a barter economy in which the growth rate of output declines over time due to the existence of positive and increasingly large barter costs. The necessary assumptions would be:

1. Transactions costs are considered a function of total output and its changes over time.[3] This assumption implies that the allocation of resources is completely divorced from the incidence and level of bartering costs.

2. The rate of increase of transaction costs is related to total output growth.

3. The standard assumptions about a neo-classical growth model with disembodied technological progress.

Define this rate of progress, or of increased specialization, as s.

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[3]Wealth and the level of technical progress could also be included as relevant factors.

Three solutions are conceptually possible:

(a) if the rate of progress s is accompanied by a more than proportional increase in transaction costs, t ($t > s$) part of potential output growth would be absorbed by transaction costs. Eventually this would result in a decline in total output. This assumption could be justified on the grounds that barter costs are likely to grow more than proportionately after a certain level of specialization in the production structure and in the volume of goods exchanged has been achieved;

(b) if transactions costs grow steadily but less than technical progress ($t < s$), they will merely reduce the rate of equilibrium growth by that factor t. If

(c) both costs and progress grow at the same rate ($t = s$) the equilibrium growth rates would obviously be identical to a situation without any technical progress. Per capita gains through increased specialization would be precisely offset by growing transactions costs.

The discussion is not pursued further here. In a modified form it will be taken up later when discussing the determination of the optimal money supply.

A dynamic model along the lines sketched above suffers from the serious shortcoming that it assumes away a crucial aspect of development and growth: the historically observable chain reaction of technical improvements in one sector of the economy leading to innovations in others. The above analysis is built on the assumption that a payments arrangement

which was presumably optimal at one point in time becomes subsequently inefficient or suboptimal without generating itself sufficient conditions for improvement. It could be asserted before barter becomes a substantial growth retarding factor in any real economy, human inventiveness and entrepreneurship would most likely devise some superior payments arrangement which eliminates the emerging inefficiencies. On rationality grounds, a means of payment -- historically some "commodity money" -- should come into existence when the bartering costs exceed the cost of using an existing capital good as money. A second serious deficiency of the model is the complete separation of the resource allocation process from the payment mechanism. This assumption cannot be justified on theoretical grounds because it presupposes that changes in an economy's payment system leave the resource allocation process, and thus relative prices, unaffected.[4]

These few remarks should be sufficient to show that a dynamic model in which transaction costs are singled out does not provide a satisfactory framework for a comparative analysis of a barter and money economy. It should also be clear that any further analysis will have to consider the joint determination of resources for production and

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[4]J. Niehans, "Money in A Static Theory of Optimal Payment Arrangements," *Journal of Money, Credit and Banking*, Vol. I (November 1969), p. 709. As the title indicates the author analyzes the problem of determining an optimal payment arrangement in a static context. He assumes that ultimate transactions are not affected by transactions costs. By doing so, he sidesteps the more fundamental problem of the allocation of resources between the production transactions. The fact that he recognizes the problem himself does not diminish it.

transaction purposes. This will be the starting point for the following analysis.

The operations of a barter state can best be described as facing two constraints:[5]

1. Barter exchanges always require bilateral balance (see Say's identity above);

2. Savings and investment decisions are restricted to a double coincidence of availability of funds and profitable investment opportunities -- a consequence which was implicit in the discussion thus far.

Increasing efficiency and specialization over time is generally associated with bilateral imbalance subject to the existing budget constraints. It is to be shown in the following how the existence of money contributes to the achievement of these ends.

B. The Introduction of Money

Assume that our model country has reached a level of specialization and volume of transactions where the total transactions cost in terms of scarce resources could be reduced if barter was replaced by some form of money. For simplicity's sake add the assumption that the transition from barter to monetization takes place within a single time period.

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[5]It would be fallacious to infer from the shortcomings of a barter payment arrangement that it cannot be Pareto optimal. This conclusion would only be valid from an *ex post* perspective, after the knowledge of a better payment mechanism has become generally spread. As long as an economy still relies exclusively on barter, the presumption should be

In any real economy this process would, of course occur only gradually. The speed of monetization will depend upon a number of variables; of the greatest importance is the rate of technical progress when seen to imply increased levels of specialization. In addition, the organizational structure of the economy, wealth and income, and the payment habits, to list just a few factors, are instrumental in this process. Ubiquity of a single commonly accepted money good or a very small number of simultaneously used commodity monies marks the end of this transition. Many underdeveloped countries today have not yet reached this stage. This fact makes an analysis of the economic consequences of monetization pertinent for development theory and policy.

According to actual historical development it could be assumed that the commodity chosen as money is gold, or some other metal. However, we shall not make this assumption initially, but rather we shall try to explain why and how this choice is made. The very fact that most countries selected their moneis from a narrow range of largely similar goods should not be considered as mere coincidence of arbitrary decisions but rather as the outcome of a rational process of choice. It could be seen as the logical extension of the conceptual birth of money mentioned above. To make this point clearer we shall attempt to simulate

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that this arrangement constitutes a rational choice. This implies that given the state of the arts total transaction costs are minimized under barter conditions. Misallocation of resources only arises once a better, i.e., less costly, organizational payment mechanism is invented. This point seems to be occasionally confused in the literature.

the decision making process leading towards the selection of the money good (or goods) from the total number of existing commodities in the economy.

Initially, there was the intellectual achievement of conceiving the advantages of a generally acceptable means of payment. This invention, when rationally applied, should then lead to the choice of a specific commodity or at best a small number of goods; the decision criterion being that the total benefits of using this particular good. Under equilibrium conditions in the barter state, the marginal benefits -- i.e., the marginal productivity -- of all capital goods are equal. With the event of the invention of the money notion, some goods will have to be re-evaluated as to their expected benefits in this alternative use.[6] More generally, we can define every advancement in knowledge to imply a change in some or all of the marginal equivalences of general equilibrium. Furthermore, by definition of the term "progress" the direction of the change of the marginal conditions is also predetermined. The production possibility frontier must have moved outward for at least one good -- in most cases a number of goods. This implies that a given amount of output can be produced with less inputs of resources than before.

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[6] We can assume that only demand conditions account for the re-evaluation of the expected benefits for potential money goods. The technical production side is considered unaffected for the subset K_m. While this is not strictly accurate this last assumption will prove useful for the derivation of the equilibrium conditions in the emerging money market.

In the case of money, it is relatively easy to narrow down the range of possible choices of goods after establishing a definite set of attributes the money commodity should have. We can define these characteristics as: portability, indestructability, homogeneity, divisibility, and cognizability.[7] This specification eliminates, obviously, all consumption goods and leaves us with the bundle of N different capital goods assumed to exist in the country. For one or more of these capital goods, call the subset K_m the expected rates of return when used as money goods are likely to be higher than the prevailing equilibrium rate. Therefore, the following inequality can be expected to exist for the whole capital goods sector:

$$\left[\sum_{i=1}^{n} p_i K_i\right]_{t+1} > \left[\sum_{i=1}^{n} pK_i\right]_t$$

where i = (1, . . ., n).

Since $[K_i]_{t+1} = [K_i]_t$ for the period of the change, it follows that the new short-term equilibrium price of capital goods will tend to be higher than the old, i.e., $p_i > p$.

To see the additional implications for the individual rates of return for capital goods we have to disaggregate them first. The invention of money is comparable to a disequilibrium situation in which the relative prices of all those capital goods which are suitable to function as money will be changed. How other relative prices are affected

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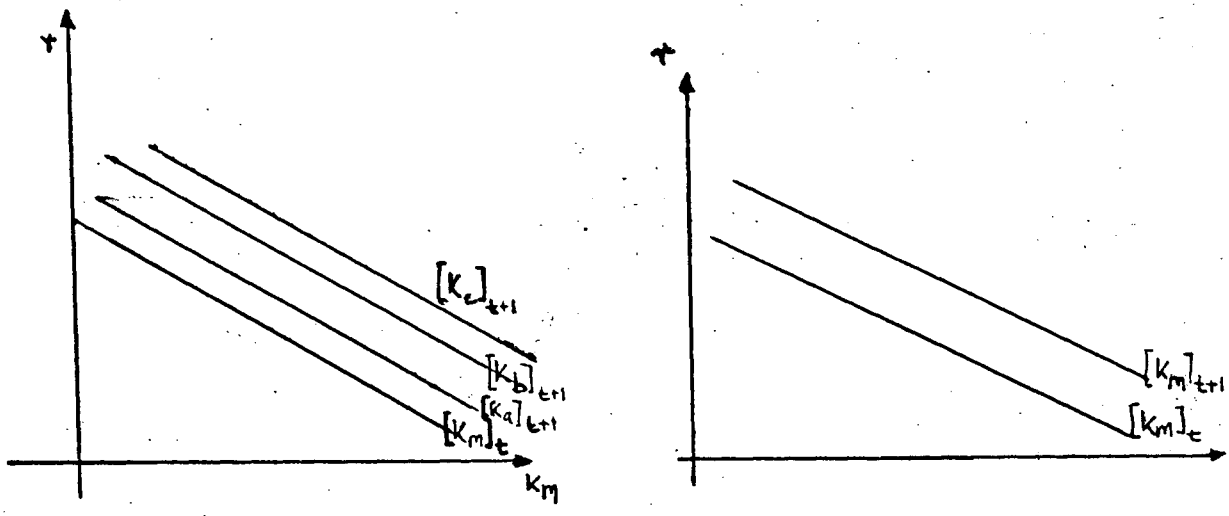
[7] J. Niehans, *op. cit.*, p. 706.

as a secondary consequence of using a money commodity does not concern us yet. Since the capital goods sector comprises a set of rather heterogeneous goods, it is easy to eliminate most of them as "non/suitable." Machines, for example, would fall into this latter category. The pursuit of this process of gradual elimination will lead to a small subset of basically suitable money goods, the above mentioned K_m (m = a, ..., m).

It can be expected that this subset possesses a large degree of homogeneity, and a high elasticity of substitution. For these goods the anticipated marginal rates of return will shift upwards in varying degrees or possibly by the same proportion. It can be asserted that the degree of shift is a positive function of the costs incurred in exchanging these goods under barter. To estimate the shift the costs of using one or a number of capital goods as money would have to be compared with the transaction cost savings. The figure below shows the possible results for the shifts of capital goods in the subset.



It is obvious from the above that if there is one good which dominates the subset because its expected yield increase exceeds all others, it will be chosen as the one and only money good. While it is easy to assert the existence of a shift in the anticipated rates of return for the relevant number of capital goods, the size of the shift cannot be established with accuracy.

After the introduction of money a higher rate of return can be expected in the existing capital stock. Standard supply and demand theory predicts that resources will, therefore, be directed into the production of those goods with the highest anticipated yields. This process continues until the expected rates of return from further investments in the production of money are reduced to some new equilibrium rate, which may or may not be the same as the rate prior to the change. A necessary condition for the new equilibrium is that the marginal rates of return are again equal in all alternative uses. Secondly, all excess demand functions for capital goods must precisely equal zero. It is only then that the stock-flow condition for an overall equilibrium are satisfied.

It may be, as was stated earlier, that several goods emerge as possible choices with equal anticipated yields. The final decision for a single money good would then be arbitrary. In fact it is feasible to choose all those goods with equal yields simultaneously.[8] The equilibrium conditions remain the same.

For the following parts of the paper we shall nevertheless use the

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[8]There is plenty of historical evidence that this actually pictures past and to a certain extent even present experience best.

simplifying assumption that there was a single optimal choice. For convenience sake we say that the choosen good is gold.

Up to now we have been concerned with the selection of an appropriate commodity to function as money without explaining the reasons and the extent of the asserted shift in the demand for gold function. The discussion all along was based on the tacit assumption that the knowledge about the advantages of using money were instantly known by all members of the community. Although information and knowledge can usually not be acquired costlessly and/or instantly, this assumption still appears moderately realistic. At least it compares favorably with the assertion "that money falls like manna from heaven."[9]

The above notes have attempted to describe the selection process of a money goods as endogenous to the system and based on the principle of rational choice. In this sense, our approach appears preferable to alternative analyses.

C. Determination of the Equilibrium in the Gold-Money Market

The equilibrium conditions for the gold market after monetization have to be developed in greater detail. The analysis is restricted to comparative statics for the time being. We assume that the competitive equilibrium conditions prevailed in all markets under barter and that the economy does not trade internationally. Below, the dynamic implications of monetization are considered, and trade flows are allowed for.

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[9] D. Patinkin, *op. cit.*, p. 4.

To restate the problem: the invention of money implies that the existing gold market receives a new dimension. The peculiarity of the market for the commodity money is its direct relationship to all other markets in the economy via the inverse dependence of the price of money on the general price level.[10] The determination of the gold market equilibrium thus entails two main problems: the knowledge of the supply and demand conditions for gold as a non-money commodity, and the modification of these conditions given the special characteristics of a money good. In the following, it will be shown under what conditions the initial equilibrium in the money market simultaneously fulfills optimality conditions.

Take the barter supply conditions for gold as consisting of an initial stock and constant proportional additions to this stock over time. At the period of transition to money, assume that the existing quantity of gold can be expanded to the desired equilibrium level within a single time unit. It is furthermore asserted that the technical

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[10] More accurately the dependence of the price of money on the prices of other goods can be expressed as:

$$p_m = \Sigma \frac{C_i \left(\frac{1}{p_i}\right)}{\Sigma C_i}$$

for all $i \neq m$ $(i = 1, \ldots, n)$ where p_m = average relative price of the money good; p_i = the relative price of all other goods; C_i = the share of the i-th good in total wealth. The expression explains the average relative price of money as the sum of all relative prices weighted by their relative share in total wealth. See B. P. Pesek and T. R. Saving, *Money, Wealth and Economic Theory* (New York: Macmillan, 1967), p. 56.

production or supply conditions remain unchanged due to monetization.[11] Why this last assumption appears reasonable will become clear after the demand conditions are discussed.

To explain the previously alleged shift in the demand for gold curve we could use the three standard Keynesian arguments about the reasons why money is demanded: the transactions, precautionary, and speculative motive. A discussion about the probable magnitude of each component appears undesirable because it would be largely based on speculation. A concise estimate of the aggregate shift in the demand for gold after monetization curve thus seems unviable. Since the most important advantage of money is the possibility of bilateral imbalance in exchanges and because this characteristic of money directly benefits economic transactions, it seems preferable to concentrate on the transactions component in the demand for money. After the equilibrium conditions are established for the transactions demand of money, it will be easy to discuss the other elements of the money demand.[12]

Assume that the initial demand for gold depends on the level of income and thus under conditions of constant exchange velocity on the level of transactions under barter. Take transactions costs as an in-

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[11] A change in cost conditions because of economies or diseconomies of scale resulting from the required expansion of gold production are, thus, considered non-existant.

[12] By definition of a capital good, money always represents a store of value, even if the asset demand for money is assumed zero.

creasing function of the total volume of goods exchanged. Assume furthermore that these costs are totally embodied in factor and product prices before monetization. A reduction in these costs is considered to accrue to both consumers as well as producers through decreased prices for factors and products. This conclusion is based on the proposition that factors of production are tied up in the maintenance of an exchange system in varying degrees. While this assertion appears obvious for the factor labor, it can be easily extended for capital resources.

The exchange of capital goods under barter conditions is likely to be difficult and infrequent. This difficulty can be attributed to the general characteristics of capital goods: they are relatively costly compared to consumption goods and typically either immobile and/or bulky. The infrequency of trading would be the result of the bilateral balance requirement under barter. This relative disadvantage of capital goods in exchange is likely to necessitate greater inventory holdings of capital goods. It could, therefore, be argued that market forces will account for this difficulty by incorporating a transactions cost element in the final product price. The introduction of a money good will facilitate exchange in general. Relative product prices can be expected to decline in accordance with the relative capital intensity in their production processes. Because there is also a distinct labor saving effect due to monetization, it is difficult to assert *a priori* which of the two elements is relatively stronger. For simplicity's sake we shall assume that both factors of production are affected proportionately. This implies that relative prices will remain unchanged, or that the relative cost savings of both factors of production decline by the same proportion after the introduction of money.

The relationship between transactions cost and total output is assumed to be most appropriately represented by the line OA in Figure 2-1. The increasing slope of OA implies that these costs are growing at a rising rate in relation to output. Eventually, the increase in costs of exchange may exceed the rate of output growth. At the production level Y(B) the economy would stop growing. Since we assumed that output of the economy was initially still increasing at some positive constant equilibrium rate, the permissable values for total transactions costs of the barter economy must lie between O and B.

Assume total output had the aggregate value of Y(O) before the introduction of money. Total transactions costs are thus TC(O). The problem is to find the quantity of monetary gold which minimizes transactions costs while fulfilling efficiency conditions in the gold market.

The relationship between the stock of gold and aggregate output is pictured in the lower left-hand part of Figure 2-1. The line OG is necessarily linear because of our assumption of steady state growth. It represents equilibrium positions in the gold market for varying levels of total output. From the steady state conditions we know that gold production increases at the overall rate of output growth if the demand elasticity with respect to output equals one. If its absolute value is less than one, $\dot{G}/G$ will be smaller than $\dot{Y}/Y$; if it exceeds one, $\dot{G}/G > \dot{Y}/Y$.

Assume that the stock of gold in existence prior to monetization and for an aggregate amount of output Y(O) equals G(O). For the elasticity coefficient it appears reasonable to assume a value of one under

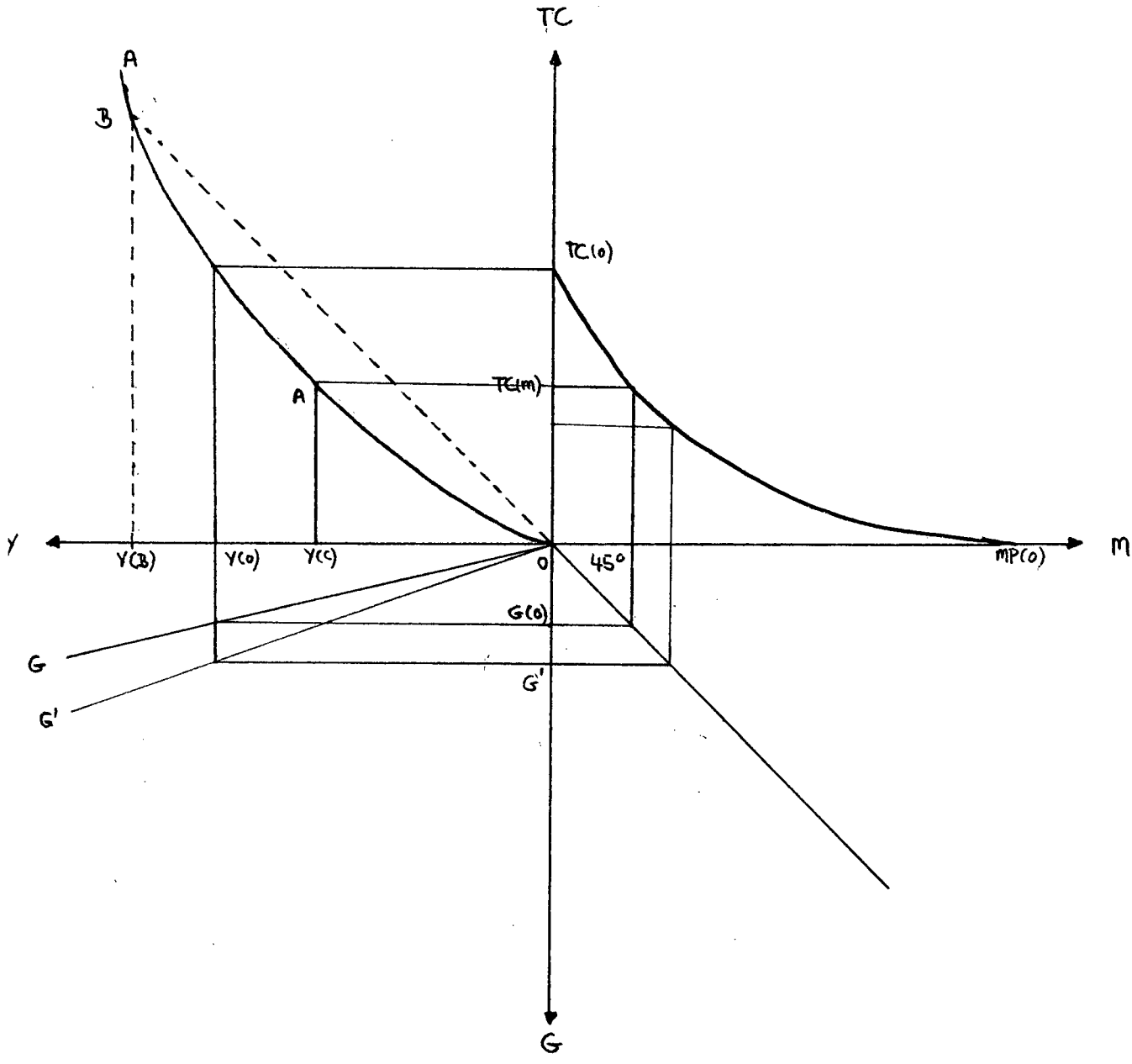

Figure 2-1

barter.[13]

Finally, we must define the dependence of total transactions costs on the real quantity of money demanded. It seems obvious that the relationship is inverse, although the precise slope of the curve cannot be predetermined with accuracy. Assume that the function relevant for the given output can adequately be represented by our line TC(O) - MP(O). This implies that for increasing quantities of money total transactions costs will fall until they are reduced to zero at a point such as M(O). The intersection of this curve can be attained if and only if two conditions are satisfied:

(a) money can be produced costlessly;

and

(b) the holding of money does not create any implicit costs in terms of yields foregone on other assets.

With gold, costless production is clearly not possible. Our problem is, therefore, dual in nature: the determination of the optimal quantity of money for a given output must reconcile the minimization of transactions costs with the minimization of resources used for the provision of the commodity money. Both minima cannot be attained simultaneously. Therefore, the problem must be reformulated as a choice between

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[13]Although this is an empirical question, there are no *a priori* arguments why the demand for gold should not have increased in proportion with total income under barter. One could not expect, however, that the existing stock of gold prior to monetization was comparatively small because of the limited productive usefulness of gold.

the viable trade-off points which either

(a) minimize transactions costs given a certain quantity of gold;

(b) minimize resources spent on the production of money such that the marginal reduction in transactions costs equals the marginal cost of using money.

The literature frequently approaches the optimization problem by assuming that the nominal quantity of money is given and constant. This implies that the (a) approach is used. The absolute size of the money stock is considered unimportant, because demand will create its own supply via price level changes.[14] We shall examine this approach first and show why the probability is small that an optimum can be attained in the money market with a given and constant stock of gold.

Return to Figure 2-1. Given an income level Y(O) and a stock of gold G(O), the introduction of money permits a reduction of total transactions costs from TC(O) to TC(M). Prior to monetization, this level of transactions costs would have corresponded to an aggregate volume of output Y(C). Total resource savings are thus represented by the difference between the old and new total transactions costs or

$$TC(O) - TC(M)$$

These were considered as accruing to both labor and capital in the same relative proportion. We can, therefore, write:

$$TC(O) = wL_T + rK_T$$

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[14] Implicit in this type of reasoning is the familiar neutrality assumption.

where L_T equals the labor services absorbed in the barter exchange process; $L_T < L$ where L is the total quantity of labor. K_T is defined as the capital used for barter exchanges and $K_T < K$, where K equals the total capital stock. w and r are the equilibrium prices of labor and capital respectively. Due to the above assumption of proportional factor savings, these remain unchanged after the introduction of money. With monetization we have

$$TC(M) < TC(O)$$

or

$$wL_T^M + rK_T^M < wL_r^O + rK_r^O$$

with the signs M and O denoting the relative factor share before and after monetization.

Whether this solution is optimal cannot be infered from the results thus far. We can only conclude that the introduction of money will not require a greater amount of resources for transactions purposes than under barter. If it did, money would not be used at all, since it would decrease society's welfare. However, given our previous arguments about the nature and timing of the invention of money, it appears most likely that positive resource savings will occur. In the extreme, the costs of using money would equal the transactions costs savings with overall welfare remaining unchanged.

The inconclusiveness of the results for a fixed quantity of gold necessitates a discussion of alternative (b) above, where the gold

stock is assumed to be variable. As mentioned earlier, we assume that any desired increase in the gold supply is technically feasible within a single time period -- i.e., during the period of transition from barter to money, the additional gold for monetary purposes can be produced. Add the assumption that the cost curve for the expansion of gold production is known and that additional gold production reduces investments in other capital goods.

The estimated increase in the demand for gold together with the barter equilibrium stock can be assumed to represent the desired quantity of "gold" for monetary and non-monetary purposes. Let this desired quantity be G' in Figure 2-1 for the given level of output Y(O). The hypothetical expansion curve in GY space could then be pictured such as OG'. Recalling that this curve represents different equilibrium points in the gold market for varying levels of output, the steeper slope indicates a greater relative share of gold in total output with monetization. Furthermore, we can infer from the above assumption that the relative equilibrium price of gold would have risen.

The new overall equilibrium conditions are now apparent. The greater quantity of gold would reduce transactions costs below the level which could be attained with the initial stock. [See point TC(M) in Figure 2-1]. However, the increase in resource savings can only be obtained by decreasing the production of other capital goods. The decision on the optimal possible solution must, thus, weigh the additional advantages of reduced transactions costs against the simultaneous decrease in investments other than money. The optimal solution cannot be shown in

the figure. We shall therefore derive it in more formal terms.

Let the existing stock of gold represent a fraction α of the total capital stock, and the portion of capital services used in transactions a fraction β. We then have

$$\alpha K = G$$

$$\beta K = K_T$$

$$\gamma K = \bar{K}$$

with $\bar{K}$ representing the residual capital stock. We can write

$$\alpha + \beta + \gamma = 1$$

and assigning a positive value to all coefficients

$$\alpha > 0;\ \beta > 0;\ \gamma > 0.$$

Furthermore, let

$$\gamma > \beta;\quad \gamma > \alpha$$

and assume a range of permissable values for α and β

$$\gamma > \alpha \gtrless \beta < \gamma.$$

Analogous to the above, we define the share of labor services needed for transactions as

$$aL = L_T$$

so that

$$bL = \bar{L}$$

where again

$$a + b = 1$$

and a and b both have values greater than zero

$$a > 0; \quad b > 0;$$

Given these assumptions, we can write the optimum conditions that transactions costs should exceed and/or equal the costs of using money as

$$wL_T + rK \geq rG$$

which is equivalent to

$$waL + r\beta K \geq r\alpha K.$$

Solving the above we get

$$\frac{w}{r}\left(\frac{a}{\alpha-\beta}\right) \geq \frac{K}{L}.$$

The equilibrium conditions for relative factor prices are

$$\frac{w}{r} = \frac{\delta K}{\delta L},$$

the optimum solution will then be

$$\frac{\alpha-\beta}{a} = 1$$

or

$$\alpha = a + \beta$$

This implies that the share of gold - the total capital stock should equal the sum of the capital and labor share used for transactions under barter. If this condition is satisfied we have both an efficient and optimal solution. The range of possible values for α and β can now be redefined as

$$\alpha > \beta.$$

If the stock of gold at the time of the invention of money satisfies the above optimality condition, there is no immediate need for expansion of the gold stock for the attainment of an initial money market equilibrium. It appears, however, highly unlikely that the actual stock of gold coincides precisely with the most efficient quantity.

We, therefore, have to consider the two remaining alternatives for the size of actual and desired stock of gold for their relevance and realism. These are:

1. $a + \beta > \alpha$
2. $a + \beta < \alpha$

The first alternative implies that the actual stock of gold is smaller than the optimal stock, because the share of transactions costs exceeds the costs of using gold. The second alternative obviously describes the reverse situation. *A priori*, neither possibility can be excluded. The probability of the first alternative appears greater on the basis of our earlier inferences about the barter state. The discussion is, therefore, restricted to this case.

We know that the equilibrium condition remains unchanged and thus $\frac{w}{r} = \frac{\delta K}{\delta L}$ still holds. This deduction can be made since the transition to money was considered to take place in a single time period. The capital stock and the total labor force remain unchanged and consequently also the equilibrium wage rental ratio.

An expansion of the gold stock is necessary until the initial inequality of $a + \beta > \alpha$ has been eliminated and the optimum condition $a + \beta = \alpha$ holds.* Given our earlier assumption that the desired gold expansion is attained by channelling parts of the constant share of investment in total output to the production of gold, the implication of this expansion is easily derived.

In the closed economic system, without government activities, the following identities hold:

$$X = C + I$$

$$I = \dot{G} + \dot{K}_i$$

where

K_i; $i = (1, m)$ represents the m-capital goods produced;

X represents total output;

I = aggregate investment;

C = consumption;

and dots indicate additions to the stock of gold and other capital goods.

With G increasing beyond its normal rate to accommodate the monetary demand, and Y, C and I unchanged, we must have

$$[\dot{G} + \dot{G}_M] + [\dot{K} + x\dot{K}_i] = I$$

with

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*This implies a change in relative factor prices.

$$+ \dot{G}_m = - x\dot{K}_i$$

and x denoting the coefficient for the relative increase in gold production.

It follows from our simple formulation that the increase in the gold stock to the optimal level can only be obtained by reducing investments in other capital goods by the same extent. As long as the decrease in transactions costs exceeds the costs of decreasing investments for non-monetary purposes, the money supply should be increased. On the margin, the additional benefits of producing an additional unit of money should precisely equal the opportunity costs of an investment. Put differently, the familiar productivity condition also holds for the gold-money market.

$$\frac{\delta Y}{\delta \dot{G}} = \frac{\delta Y}{\delta \dot{K}_t}$$

In overall equilibrium, the above equality must be satisfied not only for additions to the stock of gold, but for the total quantity of gold in existence or

$$\frac{\delta Y}{\delta G} = \frac{\delta Y}{\delta K_i}$$

which can simply be rewritten as

$$r_G = r_K$$

In order for the above to represent a true optimum situation, we know that the following marginal conditions will also hold:

$$\frac{MU_g}{MU_K} = \frac{r_G}{r_K}$$

with MU = marginal utility. The convenience yield of money should equal its opportunity cost - terms of other physical capital goods.

We are now in a position to derive a number of implications of the equilibrium conditions for the money market. Specifically, we shall discuss the neutrality question, the asset demand for money and the feasibility and desirability of competition in the gold-money market.

If an expansion of the gold stock to its optimal level is necessary, relative prices will change. If they do there appears to be a case for the non-neutrality of money. However, this conclusion does not strictly follow for two reasons. Firstly, the required growth in the gold stock which satisfies optimality conditions may be too small to change relative equilibrium prices. Secondly, the term neutrality usually refers to a different context and is thus not directly applicable here. The conventional definition of neutrality assumes a situation where money is already in existence and a number of financial assets as well. The question then posed is whether variations in the equilibrium quantity of money affect the real variables in the system. Thus far, we have merely analyzed the adjustments from a barter to a monetized state or to a situation where an absolute price level is established. The real neutrality issue arises only after the transition period is completed.

Next we shall explain why a positive asset demand for money is undesirable under any type of commodity money standard.

Assume that the demand for money is composed of two elements:

u = asset demand component

t = transactions demand component

where

$$u + t = 1$$

Let the savings rate be a constant proportional rate of the capital stock K, or

$$S = sK$$

where

S = aggregate savings,

s = savings rate.

Assume that the introduction of money does not affect this savings rate, and furthermore that an initial money market equilibrium has been established with money simply serving as a means of exchange. Lastly, assert that the current money transactions costs are financed out of consumption expenditures. With the emergence of a positive asset demand for money the composition to aggregate savings changes to

$$S = uM + vK$$

where K stands for all physical capital goods.

The aggregate amount of productive investments is thus reduced to

$$S - uM$$

since money only yields a convenience yield in terms of liquidity and/or increased security but does not obviously add to the productive capacity of the economy. If the overall objective of the economy is the maximization of the rate of per capita output growth over time,[15] it is clear that this goal cannot be attained if a positive asset demand for money exists. In each period in which more than that quantity of money is held which is necessary for transactions purposes, there is an aggregate investment loss which equals to $u\dot{M}$, where the dot denotes the change of asset money holdings over time. In addition, there exists the initial investment loss of kM_{t_0} for the period in which the asset demand first emerged.

At the end of the n-th period the aggregate investment loss L amounts to:

$$L = uM_{t_0}(1+r)^n + u\dot{M}_{t_1}(1+r)^{n-1} + u\dot{M}_{t_2}(1+r)^{n-2} + \ldots u\dot{M}t_n(1+r)$$

If

$$\frac{\dot{M}}{M} = \text{constant},$$

this can be rewritten as

$$L = uM_{t_0} e^{g+rt}$$

where

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[15] Subject to some defined minimum for the average standard of living.

g = rate of growth of money,

r = rate of investment on physical capital.[16]

Competition in the gold market is feasible under monetization as long as the gold industry is not operating under declining cost conditions. It is also desirable because it leads to the attainment of a stable equilibrium, as long as marginal cost pricing is observed. If and only if a sizeable asset demand for gold exists, it could be argued that policy makers should control the quantity of gold supplied to eliminate the divergence between private and social valuations.

D. The Effects of Monetization on Production

The conclusions about the equilibrium conditions in the money market imply already the direction and the extent of the adjustments in all the other markets. These are now discussed for the short run. Below they are extended to cover dynamic long-term equilibrium conditions.

For the period of transition from barter to money, we defined above:

$$X_B = X_M$$

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[16]This expression illustrates the economic loss which may arise because of a divergence between private and social valuations. If individuals' preferences are such that they value the security and liquidity of money holdings highly enough to forego the alternative yield on physical assets, a market failure arises. The overall economic objective of maximizing output growth could then not be achieved. This argument will reappear in a modified version in Chapter IV in the context of the discussion about cash hoarding.

where the subscripts B and M stand for barter and monetization respectively, and X represents total output. Furthermore, it was assumed that the following equality holds for additions to the productive capital stock

$$I_B = I_M$$

To be accurate, the right hand side of this equality would have to be multiplied by the barter equilibrium growth rate since dynamic steady state conditions were assumed for the barter. If the transition occurs within one time period, then $t_M = t_B + 1$. This qualification is only minor because it would not change the substance of the results and is thus disregarded. It was also shown above that due to monetization the composition of investments changes. Under barter, investments were composed of

$$I_B = (\dot{K}_i + \dot{G}_B)$$

With money this takes the new form

$$I_M = \dot{K} - \dot{K}_M + \dot{G}_B + \dot{G}_M$$

where

$$\dot{G}_M = \dot{K}_M$$

or the addition in the gold stock equals the reduction in other productive investments.

The above formulation is incomplete because it excludes the transactions cost aspect.

Define

$$\dot{K}_r = t\dot{K}_i$$

Transactions costs in terms of capital resources used under barter equalled a constant portion g of the non-gold capital goods produced. Since $\dot{G} = gK$, i.e., gold production was also assumed to increase at a constant rate in relation to the total capital stock, transactions cost are thus proportionate to total investment and in steady state to the capital stock. The capital share used for transactions is denoted $K_T = \alpha K$. The total effect of monetization on the savings--investment market thus becomes:

$$\bar{I}_M = \dot{K}_i + t\dot{K}_i + \dot{G} + \dot{G}_M - \dot{K}_M$$

$$\bar{I}_M = (1+t)\,\dot{K}_i + \dot{G}$$

$$\bar{I}_M = I_B + t\dot{K}_i$$

The bar over the subscripts indicates the total effect. Since the proportionality factor t and α was shown to have a value of

$$1 > t > 0; \quad 1 > \alpha > 0; \text{ and } t > \alpha$$

it can be concluded

$$\bar{I}_M > I_B$$

The investment potential given monetization thus exceeds that under barter conditions.

For the labor market the conclusions are obviously analogous because of the way the transactions cost function was specified initially. The number of workers is again assumed unchanged during the transition

period, or

$$L_B = L_M$$

This holds under the assumption that the total number of hours worked under barter remains unchanged in the money economy. Should some economic units decide to use parts of their time savings from monetization for increases in leisure the above equality would not hold. An accurate prediction presupposes the knowledge of the shape of labor supply curve. It appears reasonable to assume that to the extent that increases in leisure are enjoyed by individuals, they do not decrease the aggregate working time. Consumers still benefit from the change by requiring less time of their leisure hours to make their given number of transactions.[17] Since changes in the use of leisure time are not accounted in economic calculation of production effects, only that portion of time savings will be relevant that was previously productively employed, i.e.,

$$L_T = \beta L_B$$

The coefficient β thus denotes the savings of labor which can be employed in alternative uses with money.

The conclusion follows directly:

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[17] It could be argued that consumers may change their trading habits after monetization; instead of preferring more leisure they may be induced to trade even more because it is easier. A decision on this question cannot be made *a priori* but needs to be based on comparative study of preferences.

$$L_M = L_B + \beta L_B \quad \text{or} \quad (1+\beta)L_B$$

where again

$$1 > \beta > 0$$

$$L_M > L_B$$

The aggregate production function X can now be written as:

$$X = f[(K + \alpha K)\ (L+\beta L)]$$

If $\alpha = \beta$, this equation can be reformulated as:

$$X = f[(1+\alpha)K;\ (1+\alpha)L]$$

Since $K = K_i + G$, money is considered as factor of production in this equation. Conventionally, this function is written as:

$$X = f(K, L, G/p)$$

where the real quantity of money G/p (p = price level) is singled out as factor. This last formulation shows more clearly the implication of our assumption of proportional factor savings. Our specification of the function asserts that the capital resources saved by monetization also benefits gold by the same extent. This is presumably not strictly true because of the reasons for the choice of gold as money was its relatively low transactions cost under barter. However, it still appears a reasonable working assumption since it is likely that gold aslo becomes relatively cheaper to use with monetization. There are, thus, two distinct

effects. The first was the increase in the demand for gold which led to a higher share of gold in total output and as a secondary effect a reverse movement reducing the required share

For simplicity's sake we shall therefore retain the assumption that $\alpha = \beta$ for both factors of production including gold. If we now define production conditions as linear and homogeneous, the above equation can be simplified to:

$$X/L = f[(1+\alpha)k]$$

with

$$k = K/L$$

or redefining

$$1 + \alpha = e^{\gamma}$$

we get

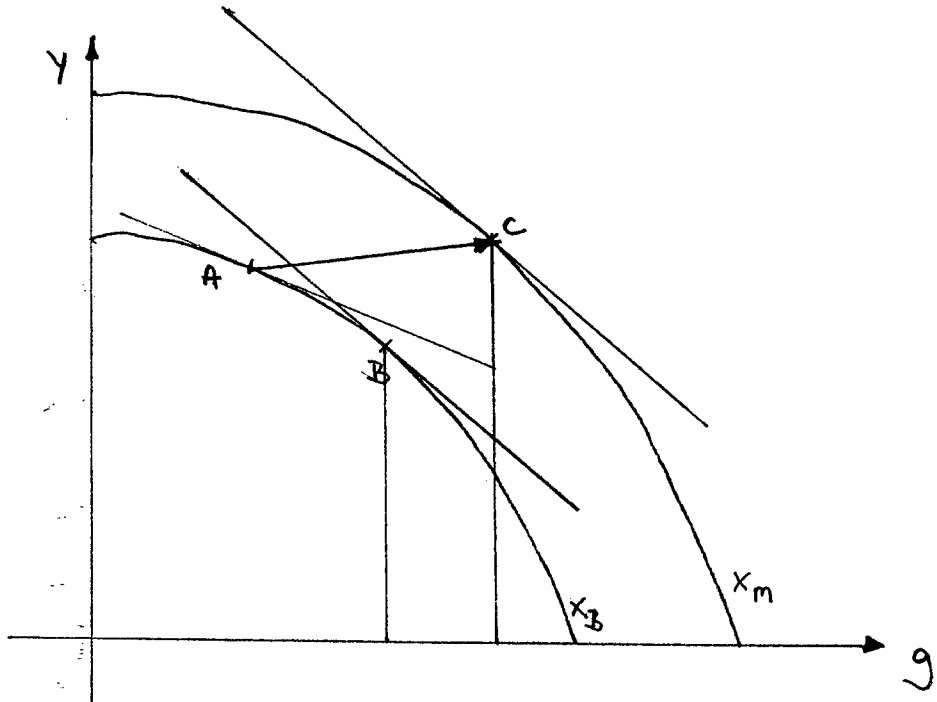
$$X = f[e^{\gamma}k]$$

This last formulation shows the overall effects of monetization are directly equivalent to a once and for all Hicks neutral technological change. It should be noted that e^{γ} does not have time in the exponent because monetization effects cannot be considered to grow independently and permanently over time.

The implications of the above for the dynamic context are now obvious. We shall demonstrate them first in a figure in comparative static form. Thereafter they are translated in formal terms.

The assumption of equal relative factor augmentation implies an equiproportionate outward shift of the production possibility frontier for both productions in the economy: gold and Y, a homogeneous capital and consumption good. The new equilibrium with monetization will be characterized by greater total output and changed relative prices as demonstrated in the two figures on the following page which show the results in factor and product space. Because both figures are largely self-explanatory we shall only briefly discuss the changes in the product markets.

Let the barter equilibrium be represented by point A. Due to the increase in the demand for gold during monetization the equilibrium share of gold in total output will rise. Relative prices change as a consequence of this expansion. In the accounting equilibrium position B the relative price of gold will thus exceed its barter level. Besides an expansion of the gold market monetization simultaneously leads to the shown savings of resources as a result of decreased transactions costs. This is represented by the curvilinear parallel shift of the production possibility frontier. If resource savings do not affect both factors proportionately as was assumed above ($\alpha = \beta$) the shift would be biased toward either of the axes. The overall equilibrium is reached at point C. There, the same relative prices prevail as in point B. The price level will therefore remain constant provided absolute prices were only set after the money market attained its equilibrium position. If we assert that social preference functions are homothetic we can unambiguously conclude that the movement from A to C implies an increase in welfare for society.



EFFECTS OF MONETIZATION AND PRODUCTION

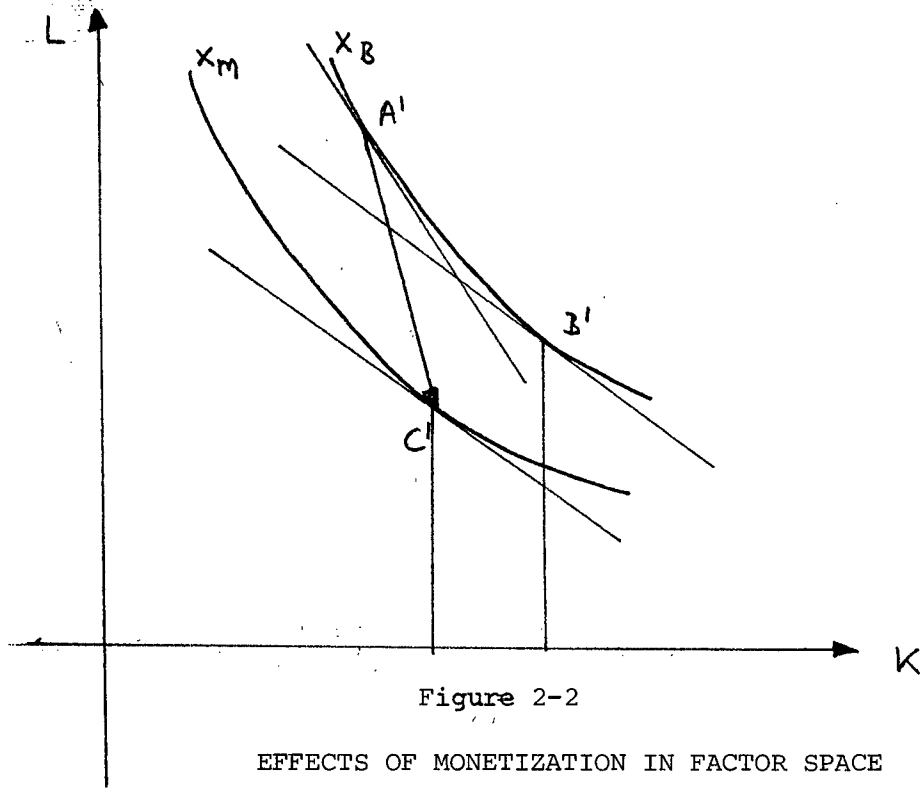


Figure 2-2

EFFECTS OF MONETIZATION IN FACTOR SPACE

E. Dynamic Aspects of Monetization

The preceeding comparative static results can now be easily converted into dynamic steady state conditions. In this section we shall prove (verify) the proposition made at the beginning of this chapter, that monetization is not likely to change the equilibrium growth rate of the system.

For the money market the steady state growth rate generally depends on two factors: firstly, the policy objectives in regard to the price level;[18] and secondly, the demand elasticity of money with respect to total output. If the policy objective is the maintenance of a constant price level, and if the income elasticity equals one, the money supply growth should be identical to that of total output, or

$$\frac{\dot{G}}{G} = \frac{\dot{X}}{X}$$

For elasticities smaller or greater than one, this obviously has to be reformulated as:

$$\frac{\dot{G}}{G} > \frac{\dot{X}}{X} \text{ for } \varepsilon_m > 1; \quad \frac{\dot{G}}{G} < \frac{\dot{X}}{X} \text{ for } \varepsilon_m < 1.$$

Which of the three alternatives is most realistic is an empirical question and need not concern us here.

The question now is whether the equilibrium growth rate of total output remains unchanged after the introduction of money. Put differently, it has to be shown that the equilibrium conditions under barter

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[18] With competitive gold production this factor is no separate policy variable -- price stability will be ensured through market forces.

still hold with money.

Assuming a neo-classical world in which only the two mentioned goods G and Y are produced, the barter by growth conditions were

$$\dot{G} = \lambda X$$

and

$$Y = (1-\lambda)X$$

which implies constant shares in total output over time or unitary elasticity.

Given this, the growth rates of total output will be

$$\frac{\dot{X}}{X} = \frac{\dot{G}}{G} = \frac{\dot{K}}{K} = \frac{\dot{Y}}{Y} = \frac{\dot{L}}{L} + TP$$

which has to equal the rate of growth of physical labor plus the labor augmenting progress factor, which was assumed to exist. Thus, if and only if population growth and/or technological progress change will the equilibrium values of the system be affected.

Population growth is unlikely to change due to monetization.[19] With constant participation rates, this also holds for labor force growth. As to the technical progress factor there do not appear to be any cogent arguments either to prove that money will induce an increase in this rate.

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[19] An explanation to the contrary would have to be based on assumptions along the following lines:

(a) endogeneous rate of population growth, depending on per capita income;

(b) constant population growth rate under barter due to unchanging standard of living -- presumably close to the subsistence level;

Reconsider the basic effects of money as to their probability of raising the rate of technical progress. Money facilitates exchange by permitting bilateral imbalances in transactions. Furthermore, as was shown above, money saves scarce resources compared to a barter state. Both factors do not lead to the conclusion that the rate of progress is, therefore, likely to increase. One could assert that the existence of money induces greater specialization in production and that this process reflects persisting increases in efficiency. However, a sequence of labor and/or capital saving innovations does not appear to follow necessarily from monetization,[20] a conclusion which seems supported by a superficial examination of economic history. On theoretical grounds, the proposition can thus not be resolved and we are left with the indefinite solution:

$$TP_M \gtrless TP_B$$

where subsigns denote monetization and barter respectively. For lack of proof, we shall assume that to the extent that an improvement in technology follows monetization it is insignificant. We can then disregard the inequality sign.

(c) rising income per capita as a consequence of monetization which induces rising population growth rates.

[20]There is one sector of the economy in which the invention of money has the relatively highest probability of leading to further innovations, namely in the saving-investment markets. Organizational improvements in the capital markets leading to the development of indirect financial markets are purposely disregarded for the time being since they are separately discussed in Chapter III.

There are a number of alternative ways in which it can be mathematically shown that the steady state conditions remain invariant with respect to a single technological improvement. A glance through the pertinent literature is sufficient to confirm this.[21]

The last two issues that need mentioning are: the implications for the new equilibrium values of the capital output and capital labor ratio, and the time required for the attainment of the new steady state. The barter equilibrium value of the capital output ratio depends on the type of savings function in existence. There are three frequently used specifications of this function within neo-classical theory: a proportional savings function depending on total output, a classical savings function which depends on the capital stock and related to the second an optimal savings function.

$$S_1 = sX$$

$$S_2 = sK$$

$$S_3 = rK$$

where r = rate of interest. Regardless of the specific savings conditions that prevailed under barter we know that if savings behavior remains unchanged with monetization the equilibrium capital output ratio must also have remained constant. Furthermore, we have implicitly the

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[21] *Inter alia:* P. A. Neher, *Growth With Technological Change* (unpublished manuscript), University of British Columbia, 1969, Chapter VII: R. G. D. Allen, *Macroeconomic Theory* (New York: Macmillan, 1968), Chapters 13, 14.

well-known stability condition that even if savings do change equilibrium growth rates are not affected. Adjustments are assumed to occur in the value of the capital output ratio only.

As with technological progress it is possible to argue in different ways about the effects of money on savings behavior. On theoretical grounds, the issue can again not be resolved. The empirical evidence presented in the first chapter was not capable of answering this question either. The tests did not strictly relate to monetization effects but to the impact of financial markets in general. If a positive relationship between finance and savings exists at all, it should have appeared there since one would expect that additional financial instruments are likely to compound the effects of money. Consequently, it seems reasonable to assume unchanged savings behavior and thus, by implication, a constant equilibrium capital output ratio.

For the remaining ratios changes can unambiguously be identified. The equilibrium capital labor ratio rises to $(1+\alpha)$ K/L and the same holds for income per capita for steady state. Thus

$$(Y/L)_B + \alpha (Y/L)_B = (Y/L)_M$$

The increase in per capita incomes implies an increase in welfare if the income distribution remains unchanged and preferences are homothetic. The Pareto condition for a welfare improvement are fulfilled since "everybody is better off and no one worse off."

As to the required time for the transition to the new dynamic equilibrium, we know from existing theory that the approach to the new

steady state will only be gradual. For a Cobb-Douglas production function $X = K^{a}L^{1-a}$, the speed of adjustment is given by the terms $(1-a)(\dot{L}/L + TP)$[22]. Depending on the values for labor's share "a", its growth rate and the labor augmenting progress factor, different values are obtained for "S". Assume, for example, that $\dot{L}/L = 0.03$, $TP = 0.02$, and $a = 0.8$. The adjustment speed then is 0.025 or 2.5 per cent per period. This finding indicates that the concern with steady states may be highly unrealistic for practical purposes since it is unlikely that the convergence process to a new equilibrium can be completed without new disturbances in any real economy. What appears as the important conclusion instead is the fact that during this slow adjustment process and as a result of monetization, income per capita rises periodically and similarly social welfare.

F. Monetization In An Open Economy

Before concluding this chapter, a short section on the monetization effects for an open economy is added. This will increase the empirical relevance of the findings and simultaneously provide a basis for comparison of the effects for the two alternative assumptions.

Initially, we intended to discuss in detail the implications of monetization for an economy with trade flows. Some thoughts on the problem made it clear, however, that the results do not change in substance

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[22]Neher, *op. cit.*, p. 40.

when compared to those of a closed system. It appears, therefore, not necessary to develop the monetization effects in great length. Instead, we chose the form of a table to show a summary of our findings.

The following assumptions underlie the analysis. Trade flows are bilateral between the domestic economy and a large world. Thus, relative product factor prices are given and constant. Furthermore, factors of production are assumed internationally immobile. For all other economic variables the *ceteris paribus* assumption based on the model of the closed economy is used. The table is shown on the following four pages; for completeness three figures are added on page 69. Together, chart and figures clearly indicate the differences and similarities of the monetization effects for both types of economic systems. Besides, they serve well as a first conclusion of the results of this chapter.

TABLE II-1

MONETIZATION EFFECTS FOR A CLOSED AND AN OPEN ECONOMY[a]

	CLOSED ECONOMY		OPEN ECONOMY
BARTER EQUILIBRIUM	Domestic production possibility frontier identical; distribution of the total product between the two goods also assumed equal.		
	Per capita income X/L_C	<	X/L_O
	Thus, welfare W_C	<	W_O
INVENTION OF MONEY	Increase in demand for gold.		
	Implicit change in the social preference function indicated by a rightward shift and increased slope of the social welfare function. (See Figure 2-2).		

[a]This table is constructed on the assumption that technical progress affects both industries in equal proportions. For the alternative assumption of an uneven impact of factor savings on both production sectors, see M. C. Kemp, *The Pure Theory of International Trade* (Englewood Cliffs, N.J.: Prentice-Hall, 1964), pp. 30-32. Kemp discusses the implications of technical change for output, factor proportions and factor rewards for the two industries separately.

TABLE II-1 (Continued)

	CLOSED ECONOMY	OPEN ECONOMY
TRANSITION IN GOLD MARKET AND IN COMPOSITION OF TOTAL OUTPUT	Increase in gold production at the cost of other productive investments. Increase in share of gold.	Anti-trade bias due to monetization: decrease in exports or increase in trade via greater imports. Unchanged composition.
PRICE OF GOLD	Price of gold rises thus relative prices change.	Price of gold remains unchanged therefore relative prices are also unchanged.
EQUILIBRIUM IN GOLD MARKET	When excess demand for gold equals zero	
	Base for establishment of stable absolute price level; initial barter price of gold as basis for price level would not have represented stable equilibrium.	Prices equals barter equilibrium prices, therefore price level could have been set instantly after invention.

TABLE II-1 (Continued)

	CLOSED ECONOMY		OPEN ECONOMY
PRICE LEVEL	price of money p_C	>	price of money p_O
	price level = $\bar{p}_C$	<	price level $\bar{p}_O$
OVERALL EFFECTS	Resource savings via reduction in transactions costs analogous to single factor saving technological progress implies equiproportionate outward shift of production possibility frontier.		
TRANSITION PERIOD GRADUAL	Gradual approach of the new steady state.		
	Income per capita rises.		Income per capita rises.
	Factor intensities change.		Factor intensities remain unchanged.*
	Factor reward w changes $w\uparrow;\ r_B = r_M$		Factor rewards remain unchanged** in both industries.

*Explanations for these footnotes are given on page 68.

TABLE II-1 (Continued)

	CLOSED ECONOMY	OPEN ECONOMY
DYNAMIC EQUILIBRIUM CONDITION	Growth rates for both systems unchanged if population and technological progress growth rates remain constant. $\dot{(X/X)}_C = \dot{(X/X)}_O$	
	Equilibrium income per capita compared to barter $X/L_{BC} < X/L_{MC}$	$X/L_{BO} < X/L_{MO}$
	X/L	X/L
WELFARE	Increase $W_{BC} < W_{MC}$	Increase $W_{BO} < W_{MO}$
	Relative Increase	
	$W_{MC} >$	$W_{MO}(b)$ if anti-trade conditions prevail
	$W_{MC} <$	$W_{MO}(c)$ if imports bias exists
		$W_{MO}(b) < W_{MO}(c)$

TABLE II-1 (Continued)

Explanation of the symbols:

subscripts "C" and "O" denote closeness and openess of the economy;

"B" and "M" stand for barter and monetization respectively;

"w" = wage rate; "r" = interest rate;

"W" = social welfare.

Other symbols were explained earlier.

* Proof for the constancy of factor intensities for linear homogeneous production function. If dY/dL can be expressed in terms of k = K/L constancy is proven.

$dY/dL = dK_Y/dL \cdot k_Y^{-a}$ where $y = k_Y^{1-a}$; $Y = Y/L_Y$; $g = k_G^{1-b}$; $G = G/L_G$

and $K = k_Y.L_Y + k_G.L_G$ with $dL_Y = dL_G$ $dK = k_Y dL_Y - k_Y dL_Y$;

or $dK = dL_Y (k_Y - k_G)$; $dK/dL_Y = k_Y - k_G$

inserting in first expression we get $dY/dL = (k_Y - k_G) k_Y^{-a}$ and $dY/dK = dk_Y (k_Y^{-a})/k_Y - k_G$

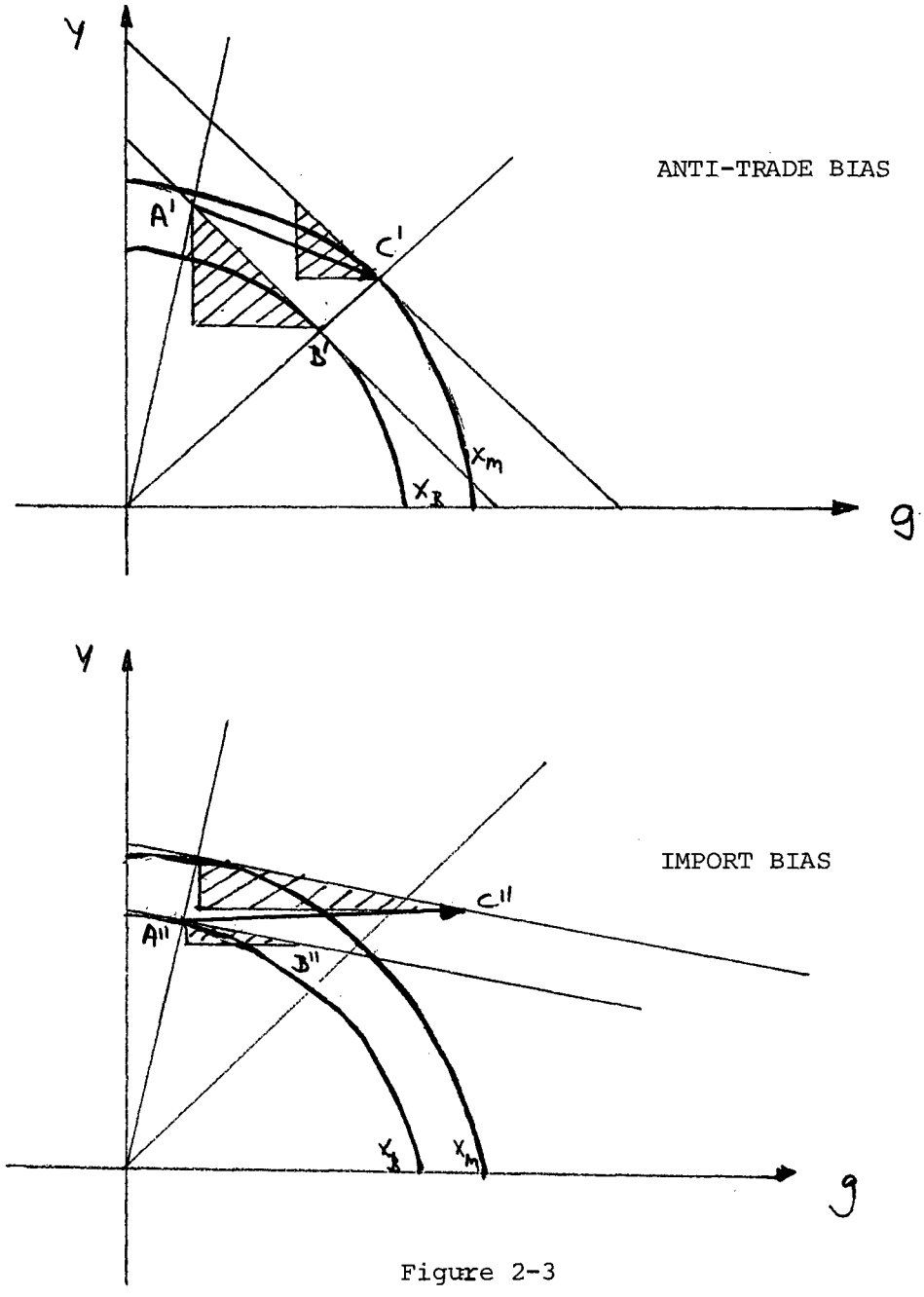

Figure 2-3

The points A, A' and A" show the initial equilibrium situation under barter. The points C, C', and C" the final equilibrium points with monetization. The arrows of the lines AC indicate the direction of the change which can be separated into two distinct movements analogous to Figure 2-2.

The table is largely self-explanatory. Two points, however, deserve separate mention. The first is the establishment of the initial absolute price level. For the closed economy it was illustrated above that it is desirable to assign nominal prices to all goods and factors only after the money market has reached a new equilibrium with monetization. This does not apply for the case of an open economy as assumed here. If prices are determined outside the domestic economy the absolute price level can be established instantly after the invention of money. However, under such circumstances, money prices lose their significance because they merely function as parameters, not as policy variables of the system.

Secondly, the table shows that the welfare increases in the two systems differ with the precise extent depending on the initial trade conditions under barter. For a country which exports gold under barter it appears that the relative increases in welfare is less than for a comparable closed economy. This conclusion is based on the following thoughts. If a closed economy's preference function changes due to monetization given a certain level of total output, it can be inferred that a movement from A to B would leave the level of social welfare unchanged. The second movement from B to C increases welfare by the proportion of the shift in the production possibility frontier.[23] Therefore, the final position is "better" than the initial point A.

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[23] A necessary and sufficient condition for this conclusion is the assumption of homotheity of the social preference functions.

For the country which exported gold initially the welfare improvement is less because of the anti-trade bias of the invention of money. This follows, if it is assumed that the welfare increase for a given production level depends positively on the difference between the domestic total output of both goods and the final equilibrium level with trade. Put differently, the relative size of trade flows is assumed to be a positive function of the improvements in welfare that can be attained through trade. It then clearly follows that the relative gain from monetization is less for the gold export nation than for the closed economy.

If relative product prices led to the import of gold under barter, then the import bias from monetization appears to increase welfare more than proportionately compared to both alternative situations discussed. This holds if the same arguments about relative welfare gains are again applied. Since prices are determined outside the domestic economy for the two types of an open economy assumed here, the question about maximizing the welfare increase is not subject to the control of the domestic policy maker. Directly analogous to the conclusions about the absolute price level, the international market determines in this situation how much the domestic economy will benefit.

G. Conclusions

This last chapter was concerned with the development of a monetary theory for a barter economy. The invention of money was tentatively explained as the necessary and logical outcome of increasing transactions costs over time. Similarly the decision on a specific money good was seen to be the result of a process of rational choice. Implicit in our discussion was the assumption that individuals correctly anticipate the benefits of money as means of payment. The aggregate demand for money then satisfies the combined minimax conditions: maximum satisfaction for consumers with simultaneously minimization of transactions costs. A third condition is necessary to assure that the equilibrium in the money market also satisfies optimality conditions: efficiency in the allocation of scarce resources in the production of money and in the use of the existing stock of money.

Several implications emerged after the optimality conditions were established.

1. There exists one and only one quantity of money for a given level of output which fulfills all optimum conditions.

2. Therefore, there is also only a unique absolute price level which is both stable and optimal.

3. Competition is capable of producing this equilibrium if technical production conditions allow for this market structure.

4. To the extent that the production and use of

> a money good requires positive amounts of scarce factors and products the demand for money as store of value for precautionary or speculative motives, is socially undesirable because it ties up resources which could be used productively. Commodity money should thus only function as a means of payment.

This last conclusion implicitly describes the advantages of a non-commodity standard for money. If production costs of money are zero or close to zero, no economization of money balances is necessary from a production point of view; money then becomes a free good. From the point of view of money demand, a saturation of demand could only be attained if the yield of money equalled the return on alternative capital goods.[24] Lastly, it is obvious that competitive production of such a zero-cost money is not possible without government control.

As to the effect of monetization on economic growth the finding was not conclusive. It was shown that monetization alone is not likely to increase the equilibrium growth rate of a competitive economy. Nevertheless, it could be demonstrated that the introduction of money is important and socially desirable on several accounts:

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[24] If the return on money equals the yields on physical assets it could be expected that this leads to the undesirable situation where consumers will exclusively save in the form of money holdings. Furthermore, increased money balances would decrease physical investment possibilities given a constant share of savings. In the absence of financial intermediation or alternatives as long as money is held in cash, this inference is justified. This conclusion would be fallacious in a system with indirect financial markets. A multiple quantity of investment loans can be provided by the financial system for a given amount of money deposited.

(a) it increases per capita income;

(b) it raises efficiency in the organization of production and trade;

(c) it increases leisure time for consumers;

(d) it increases welfare.

The above findings provide sufficient reasons to consider efficient monetization as an important precondition for growth. In Chapter IV below we shall address ourselves to the question whether Thailand uses money efficiently. In the following chapter we must first discuss the relationship between financial intermediation and growth.

CHAPTER III

FINANCIAL MARKETS AND GROWTH

A. Introduction

The following chapter examines the proposition that the development of financial markets and institutions[1] is not only more efficient than a system relying merely on money, but that it is furthermore necessary for exchange efficiency in the capital market.

In the last chapter it was argued that the invention of money was a logical necessity in the face of rising transactions cost. Similar reasoning could be used for an explanation of the emergence of financial institutions. New financial instruments would be created and used whenever an economic need arises, i.e., if under existing circumstances certain objectives cannot be attained with known technologies. Such a deterministic approach could be termed bottleneck-causation or a compulsory sequence of invention. This line of arguments is not pursued here. Instead, we shall assume that a set of efficient financial markets is introduced at a certain point in time, thereby abstracting from the gradual development of these markets. The assumption is made in view of our stated objective to determine the cause-effect relationship between finance and growth.

Evidence cited in the first chapter on this issue only established a one-way dependence between real and financial growth. It was not capable

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[1] The expressions: financial markets, financial institutions, financial systems, and direct and indirect finance are used coterminously.

of explaining the possible feedback effects from financial systems to development which are most crucial for evaluating the importance of financial markets. The inconclusiveness may have partially arisen because existing financial markets in developing nations are not operating efficiently and/or because their size is too small given the extent and growth of the economy. It appears desirable, therefore, to base the analysis on the assumption of fully developed, and efficient financial markets. This implies that all those financial instruments are available which warrant maximum efficiency in the operation of the capital market, given technological knowledge. This approach will aid the understanding explanation of the potential effect these markets could have on the process of growth.

B. Efficiency of Financial Markets

The analysis of the monetization effects in the last chapter ended with the establishment of the new steady state conditions. It was shown that the growth rates in a monetized system are likely to remain unchanged when compared to a barter state. We use these conclusions as frame of reference for the present chapter. We, furthermore, assume that the monetized economy had not developed any financial markets. This allows us to show the significance of financial markets in terms of an extension of the advantages of money.

By the term "financial markets" we include both direct as well as indirect financial relationships. Historically, direct finance pre-

ceded the system of indirect finance; similarly the invention of a commodity money occured before that of a paper or bank money. In the last chapter it was possible to concentrate entirely on the economic implication of introducing a commodity money since all major consequences would be shown by using this assumption. A similar procedure is not desirable for the present chapter because the most important advantages of financial markets appear only after the establishment of financial intermediaries and, therefore, with indirect finance. We focus, therefore, immediately on the aggregate effect of all financial markets.

The introduction of money allowed investment spending to be distributed in a different way from saving. Without operational financial markets, the distribution differences due to the existence of money are only of intertemporal nature; not however, interpersonal. In other words, money allows economic units to invest in excess of current savings by drawing down previously accumulated money balances. The reverse, obviously, holds true as well. Saving greater than current investment is possible via increased money holdings. Under barter, savings and investments were always simultaneously determined, equal not only ex post but also ex ante because the person of saver and investor coincided.[2] Money increases the scope for the individual by adding flexibility in the timing of investments. As Gurley correctly points out, this fact is conducive

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[2]This is an oversimplification. It is more likely that some borrowing and lending already took place under barter conditions. However, the amount of real goods loaned and borrowed is assumed insignificant enough that it can be neglected.

to increased specialization and opens up the possibility for a more efficient ordering of investment throughout the economy.[3]

The drawback to monetization without financial markets is that the level of investment is constrained by the existing income and wealth distribution. The inefficiency of such an arrangement can be clearly seen if the following assumptions are accepted. In accordance with historical and present evidence take the distribution of income and wealth as relatively unequal. Add the assumption that intelligence and entrepreneurial abilities are normally distributed among the members of society. It then follows that unless a redistribution of resources is feasible the economic system is not efficiently allocating its total resources -- human and non-human. This is where financial markets can improve the allocative process.

The most important feature of financial markets for debt instruments is that they allow for the separation of the saving and investment decisions among different individuals, subject to the constraint that all deficits must be matched by surpluses in other economic units. The consequences of this initial innovation are well expressed by Gurley:

> "The ability of economic units to borrow directly from one another affords those with highly productive investment projects more scope than before to bid away resources from others withe less productive projects. Primary securities stimulate real growth by increasing the probability that alternative investments will be exploited in order of their productivity. They also

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[3] J. G. Gurley, "The Saving-Investment Process and the Market for Loanable Funds," in *Money and Economic Activity*, Third Edition, L. S. Ritter (ed.), (Boston: Houghton, Mifflin, 1967), p. 51.

> more fully exploit financial incentives to saving and thereby make it more likely that the level of savings and investment will be raised." 4

Gurley in this quote addressed himself to a system of direct finance. The introduction of financial intermediaries adds substantially to the benefits outlined above. Financial intermediaries[5] stand between ultimate borrowers and lenders. By borrowing surpluses of household units in exchange for the indirect securities that they issue, they partly resolve the conflict between lenders and borrowers which still exists in a system of direct finance. The cause of this conflict can be attributed to the character of a primary security, which implies a direct dependence between the borrowing of funds and the use of the savings for specific investment projects. To the extent that savers and lenders desire different attributes in a security (for example greater or lesser liquidity) their wants are not likely to be satisfiable in a system of direct finance, but can only be achieved through financial intermediaries. The function of these institutions can be defined as the transformation of long term, relatively illiquid assets into comparatively safer, liquid, short term financial assets. By offering a wide variety of alternative choices they

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[4] Gurley, *op. cit.*, p. 52.

[5] By intermediaries all those agents are included which function in the borrowing and lending markets. Historically, these were first and foremost commercial banks, supplanted later by a plethora of other financial institutions such as savings and loans associations, insurance agencies, stock brokers, and the like.

thus reduce the above mentioned conflict. In this process of transmutation of assets, financial intermediaries, furthermore achieve economies of scale in the costs of transferring funds and of pooling risk.[6]

The question now is to determine the implications of having a set of such agents in an economy in which they were previously non-existant. The first logical step towards this objective is again, as in the monetization case, the establishment of the equilibrium conditions in those newly created financial markets. Thereafter, the overall economic effects can be derived.

Analogous to the last chapter, it is assumed that the attainment of the equilibrium in the financial markets can be achieved within a single time period. We further add the assumption that the initial establishment of financial institutions is costless.[7] In this respect, the situation is thus considered different from the gold monetization case, where a scarce resource had to be allocated efficiently in its new function as money. We assert that the emergence of financial markets does not necessarily reduce production or consumption of any good in the economy. To the extent that resources are needed to set up financial agencies, we thus im-

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[6]The problem of risk appears particularly severe for underdeveloped countries. There the resource allocation process may be improved substantially because of a reduction between the difference in private and social risks. If private investment decisions are dominated by considerations of risk and the private risk factor exceeds the social risk involved, resource misallocation results. If financial intermediaries spread risks they can improve the efficiency in the allocation of resources.

[7]The services of financial institutions are, of course, not assumed costless.

plicitly assume that they have no prior use and/or that they are substituted for former leisure time.

A second difference from monetization analysis should also be noted at this point: because borrowing is largely done for investment projects, the main effects of finance are likely to be found in the capital goods market. The implications for overall production and growth in the economy will, consequently, originate primarily in this market. To the extent that other direct spill-over effects exist to non-capital markets, they are assumed to be of secondary importance and thus not discussed.[8] By comparison, the important factor with monetization was the global impact of the invention of money on all economic transactions. It should, however, not be inferred from this statement that the aggregate effect of money on output is, by definition, greater than that of financial markets. How their respective impacts compare will be discussed in the conclusions to this chapter.

C. Equilibrium in the Financial Markets and Overall Equilibrium Condition

The stages of the process towards a new equilibrium are first shown in diagrammative form. Thereafter, we shall briefly summarize the effects on the new aggregate volume of loanable funds more formally.

In the market for loanable funds, the emergence of financial intermediaries is likely to produce a reduction in the equilibrium in-

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[8] Consumption of loans are relatively important in the context of developing countries. We shall still disregard their existence and discuss the modification of the present arguments in Chapter IV.

terest rate for a given quantity of funds provided to the borrowing sector. Furthermore, there will be an expansion in the volume of loanable funds. The aggregate shift in the supply of funds curve is composed of four elements:

1. The relative cost savings achieved by financial intermediaries in the provision of financial services compared to those of households before the change.

2. The desired credit multiplier by the financial institution.

3. The reduction in risk achieved with widely diversified portfolios of intermediaries.[9]

4. The quantity of money used for transaction purposes prior to the change.

The sum of these components when subtracted from the former supply price for varying quantities of funds represents the new supply curve of financial intermediaries. The willingness of households to accept lower returns for varying quantities of funds is determined by the greater liquidity, safety and variety of asset alternatives households can acquire with their savings.

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[9] If we retain the former assumption, made in Chapter II about competitive markets operating under conditions of certainty, the risk element obviously does not exist. Thus only (1) and (3) account for the shift.

Figure 3-1 below is drawn on the assumption that the demand for funds remains unchanged with the emergence of financial markets. The demand for funds curve is thus seen as a reflection of technical productivity conditions in the capital goods market.

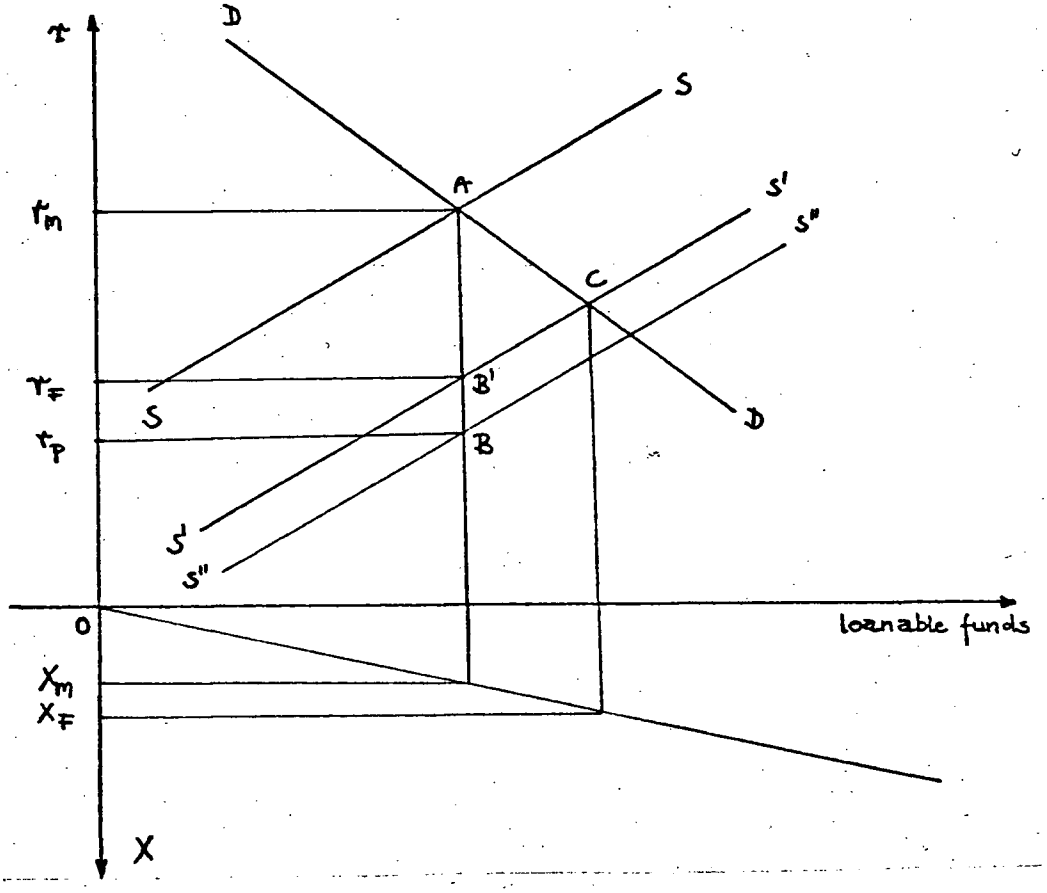

Figure 3-1

Let point A reflect the equilibrium position before the change. Borrowers thus pay an average interest rate of r_m which money lenders and private individuals receive for their savings. Point B and B' is taken to represent the new equilibrium point for the period after the transition. Private savers get the new and lower return of r_p,[10] financial institutions are assumed to change an average interest rate of r_f for the provision of funds. The difference BB' is explained by the costs of providing financial services.

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[10] r_p would be an average rate for time and chequing deposits.

Thus far, we focused on the interest rate effect of financial markets. Looking now at the impact on the aggregate volume of loanable funds the extent of the gain through finance can be more clearly demonstrated:

Assume a certain amount of money M is held cash for transaction purposes prior to the emergence of financial institutions. A substantial share of these balances will be deposited with intermediaries except for a minimum necessary for petty cash payments. Call this fraction v, with v close to zero. The volume of transaction balances deposited thus amounts to (1-v)M. In addition, assume that the total volume of savings is also placed with financial institutions. Furthermore, take the desired deposit multiplier as d, with $0 > d < 1$. The potential expansion of credit then amounts to:

$$\frac{1}{d}(1-v)M + \frac{1}{d}S = L_F$$

where S = aggregate savings,

L_F = total loanable funds with finance.

Specify

$$M = tY$$

$$S = sY$$

$$C = (1-s)Y$$

with t = rate of transaction balances demanded, s = savings ratio, C = aggregate consumption.

We can then write

$$\frac{1}{d}(1-v)tY + \frac{1}{d}sY = L_F$$

$$\frac{1}{d}Y[(1-v)t + S] = L_F$$

For subtracting the quantity of loanable funds prior to the change from this last expression, we assert that this amounted to

$$S = L_M{}^{11}$$

we thus get

$$\frac{1}{d}Y(1-v)t + sY\left(\frac{1}{d} - 1\right) = L_F - L_M$$

This represents the aggregate effect of the introduction of financial markets on the volume of loanable funds which could be provided under *ceteris paribus* assumptions for the level of income, savings and the transaction balances. The formulation makes it obvious that the potential increase in loanable funds is substantial and may amount to a multiple of aggregate output at the time of the change.

The above showed that borrowers are better off under the new arrangement since they pay the new lower interest r_F for their loans and furthermore, that the availability of funds has greatly increased. Savers' welfare did not decline either, because they now enjoy greater liquidity and security for their savings. It thus follows that aggregate welfare must have increased. The difference between the old and the new

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[11] This implies a multiplier of one prior to the change.

equilibrium goes, however, beyond a welfare gain. The cause is aggregate resource savings shown as the rectangle $r_F B'Ar_M$ in Figure 3-1. The fact, that a given quantity of loans can be borrowed for fewer resources than before, without creating a corresponding decrease in the supply of funds, implies that a certain quantity of resources are now available for other uses. In essence, the introduction of financial markets is thus comparable to technological progress, since the precondition for the occurrence of progress is fulfilled: factor savings are attained in producing a given quantity of output. Alternatively we could describe the consequence of the emergence of financial markets in terms of a shift in the production possibility frontier.

What has to be resolved next is the question how, and to what extent, factors of production are affected. Different solutions could be given, depending on the specific assumptions made about the borrowers' use of these resource savings. Given our assumption above that loans are only used to finance investments, we can infer that savings will first directly benefit the investment sector. This is shown in point C in Figure 3-1, which represent the equilibrium point at the end of the transition period. We can derive this conclusion more clearly by translating the equilibrium conditions of the financial markets into factor space.

Figure 3-2 illustrates the effect. Let I_M represent the relevant isoquant under monetization without financial markets. The line $\overline{KL}$ shows the prevailing relative factor prices and point M denotes the equilibrium quantities of capital and labor used. The introduction

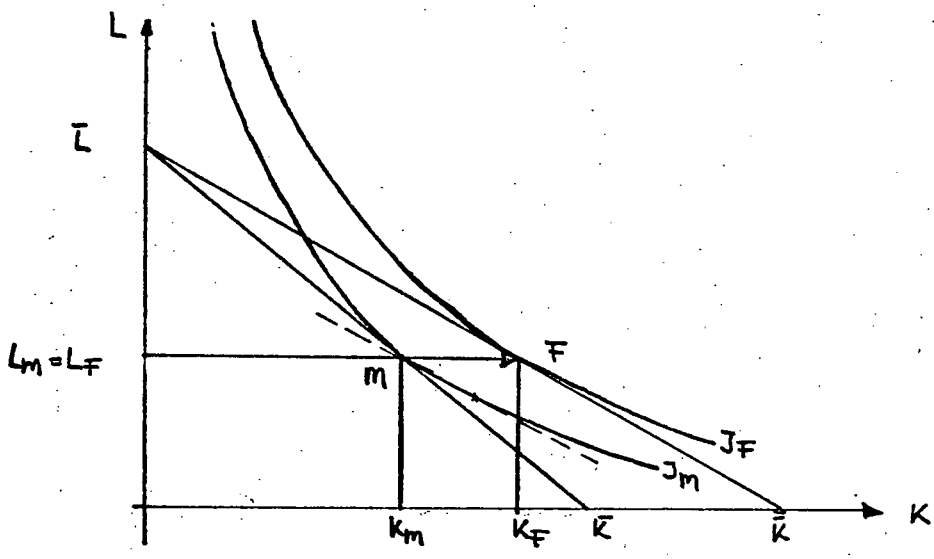

Figure 3-2

COMPARATIVE STATIC EFFECTS OF FINANCE IN FACTOR SPACE

of financial intermediation decreases the price of capital as shown in the diagram above for investment flows. This implies that relative factor prices changed as indicated by the line $\overline{KL}$. For an unchanged level of output, this input price change induces a substitution of capital for labor as shown by the dashed line which has the same slope as the new price line. In addition, there is the output effect due to the decreased production costs. Both effects lead to a new equilibrium situation in which a greater quantity of output is produced with relatively more capital. For simplicity's sake, we assume that the quantity of labor used after the change equals the previously prevailing full employment amount. This assumption is illustrated by the equality of L_M and L_F in the diagram. The increase in aggregate output due to the introduction of financial markets can also clearly be seen in the lower portion of the first diagram, which relates the flow of capital formation, e.g., I, to total output. Drawn on the assumption of constant relative shares of savings out of total income X, the reduction in costs for investment funds is seen to result in an increase of aggregate output from X_M to X_F.

In the new equilibrium we thus have an increased capital intensity, increased investments, higher income per capita and correspondingly higher consumption per capital. Given the knowledge of the comparative static equilibrium conditions the derivation of the steady state conditions follows automatically. It was already established above that the effect of the introduction of financial markets was essentially equal to a once and for all technological improvement. The discussion of the resulting

factor market changes showed that the nature of this change can be described as a capital augmenting technical change. We can, therefore, note a further difference of the effects of financial markets as compared to those of monetization: while money augmented both factors of production, financial markets appear to induce only capital saving effects. The similarity of both innovations thus far seems to be that monetization as well as financial markets have only the character of a single technical improvement. Given this, we know from the last chapter that the steady state growth conditions remain unchanged. The equilibrium growth rate would only change if either the rate of labor force growth and/or the rate of technological progress would increase permanently as a result of the emergence of financial markets. Recall furthermore that rising savings rates cannot alter the equilibrium conditions but merely produce corresponding adjustments in the capital output ratio. Increased savings do, however, lead to greater rises in income per capita in the transition period to a new steady state than if the savings ratio remains constant. This fact, together with the known length of the adjustment period to a new steady state, reaffirms *a priori* expectations about the importance of the savings variable.

From a policy point of view, it appears most appropriate to discuss the probability of increased savings rates induced by the existence of financial markets. Possible linkage between finance and population growth and/or technological progress are not considered because no conclusive arguments about the existence and magnitude of such effects could be established.

The general consensus of authors[12] who have written about the relationship between financial and real development seems to be that financial markets induce real growth via increased savings rates. The arguments provided for this conclusion differ superficially but not in substance.[13] None of them appears convincing. For savings rates to rise permanently, it has to be argued that desired savings depend upon the existing institutional structure and/or that an increase in choice of assets raises the preference for savings. Both assumptions seem to be rather far reaching when compared to the conventional hypothesis about the determinants of savings: income, wealth and the interest rate.

The introduction of financial markets was shown to decrease the level of interest rates and raise the income level. In terms of conventional theory this implies that as long as the relative increase in output exceeds the relative decline in the equilibrium interest rate savings could even be expected to decline. A simple formulation of the permanent savings hypothesis would thus lead to the following three possible results:

$$\text{If } Y/r = W$$

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[12] J. G. Gurley and E. S. Shaw, "Financial Aspects of Economic Development," *American Economic Review*, Vol. XLV (September, 1955), pp. 515-39; H. T. Patrick, "Financial Development and Economic Growth in Underdeveloped Countries," *Economic Development and Cultural Change*, Vol. XIV (January, 1966), pp. 174-89; D. S. Paauw, "Financing Economic Development in Indonesia," *Economic Development and Cultural Change*, Vol. IV (January, 1956), pp. 171-85.

[13] Gurley and Shaw use an extension of the division of labour argument; Patrick emphasizes the availability of funds; others stress the increased need for funds with increased specialization. All conclude that for these different reasons financial institutions will induce raising savings rates.

where

Y represents annual income,

r = equilibrium interest rate,

W = total wealth,

and $S = f(W)$ and $dS = f'(W)$ with "d" denoting the rate of change.

(a)	$dY > r$	W increases	dS decreases
(b)	$dY = dr$	W constant	dS zero
(c)	$dY < dr$	W declines	dS increases

Some type of permanent savings hypothesis appears to be the most reasonable assumption about savings behavior that can be made *a priori* and as long as one believes in an individual's as well as society's ability to plan rationally for the future. If this assertion is accepted, it follows that no simple inference can be made about the direction of change in the rates of savings. To do so would require the knowledge about the relative output and interest changes which follow the invention of financial markets. We shall not try to estimate these gains, since we only want to emphasize how dubious assertions about savings behavior can be.

Another reason why some authors argue that savings will increase with the development of financial markets may be that they identify desired savings rates with observable differences between national product and consumption. This residual approach is clearly unsatisfactory. With emerging alternative possibilities for the forms in which savings can be held one would expect that previously accumulated hoards of different types

are substituted for financial assets. Such a replacement process does, however, not increase the rate of savings but merely changes the composition of assets held.

D. Necessity of Financial Markets

In this last section we shall look at financial markets from a different perspective: thus far, their benefits over and above a money economy without direct and indirect financial were stressed. We now argue that trade in capital goods is a necessary condition for efficiency in the resource allocation process. Since financial markets were shown to perform this trading function most efficiently, the arguments will, therefore, indirectly prove the importance (necessity) of these institutions. If the following two assumptions about the state of nature and technology are accepted together with the next two assertions about the existing state of affairs in society, the proof is easy.

1. The distribution of intelligence approximates a normal distribution.

2. Efficiency in investments requires a certain minimum quantity of both human and physical capital. The actual size varies with technological knowledge.

3. The initial resource endowment with physical capital is unevenly distributed.[14]

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[14] If we furthermore assumed that the average initial endowment of physical capital per man is smaller than the quantity required for efficient investments, the trade necessity would be self-evident. This assumption is, however, not necessary for the derivation of the conclusions.

4. Human capital or its observable proxy income per capita is also unevenly distributed.

From standard theory we know the following efficiency conditions for a stable equilibrium:

$$\frac{\delta X}{\delta K_H} = \frac{X}{K_H} = \frac{\delta X}{\delta K_p} = \frac{X}{K_p}$$

Average and marginal returns on both physical as well as human capital must be equal.

where

K_H = human capital,

K_p = physical capital,

X = total output.

Without having to derive the implications of the conditions formally, it is obvious from the four assumptions, that maximum efficiency cannot be attained without trading in capital goods. Some resources will have to be transferred from those individuals with relatively large endowments in physical capital and low entrepreneurial abilities to others with relatively greater abilities but less command over resources. In final equilibrium welfare would be maximized if incomes per capita, thus human capital would also approach normal distribution. The optimal size of investments would be determined by technical production and cost conditions. It is attained if production costs are minimized and all capital earns the average market rate of return.

This approach could lead to a discussion of different normative issues, which we shall disregard. Two points are worth mentioning, how-

ever: an initial inequality in the distribution of total wealth does not impede efficiency in the allocation of resources, provided capital trading exists. An optimal arrangement of capital market services would allow for the provision of loans depending on abilities and/or technical production requirements but independent of existing endowment of capital resources. This is utopia. In reality, the ability to borrow depends heavily on the amount and type of collateral an individual can offer, not on expected returns on physical and human investments. Financial institutions, such as competitive banks, are not in a position to implement utopia for the obvious reason of the risk element involved, due to the low probability of correctly assessing individual abilities.

The above re-affirms our previous findings: financial institutions are necessary to guarantee maximum efficiency in the resource allocation process. However, even if an optimal arrangement of financial service was practically feasible, it is doubtful whether it would induce rises in the economic growth rate of an economy.

E. Conclusions

We have shown in Chapters II and III that the only definite causal effect of the introduction of money and financial markets on the growth process takes the form of two separate single technological improvements. In the case of monetization the technological progress factor appeared to augment both factors of production, while it only increased the input factor capital after the establishment of financial markets.

Induced increases in the savings rate through each financial change seemed *a priori* unlikely for monetization and for financial markets. Similarly, inconclusive results were found for the linkage effects between a permanent rise in the rate of technological progress and the two financial improvements. For an economy which was growing in steady state under barter these results implied that the new equilibrium growth rates after monetization and finance are likely to remain unchanged. These findings suggest the interpretation that money and finance appear to be important preconditions for efficient equilibrium growth. Taken by themselves, their existence provides only a necessary but not sufficient condition for induced increases in the growth potential of an economy.

The desirability of both types of financial improvement could clearly be established. Each innovation was shown to increase income per capita and thus total welfare, as a direct consequence of their appearance.

The simplified set of assumptions used in the model proved helpful in the derivation of these results. It precluded, however, the incorporation of certain factors, which may more realistically reflect the situation in the developing countries. One of these model assumptions was the sudden "overnight" appearance of both money as well as financial markets, which were asserted to operate efficiently and under equilibrium conditions within a single time period after their emergence. The rationale for this particular assumption was twofold: firstly, we found inconclusive empirical evidence about the existing relationship between finance

and growth. Secondly, there was a strong presumption that this lack of significance in the explanatory value of the data was at least partially due to the inefficiency with which these markets actually operate. With our model assumptions and the resulting conclusions we are now in a position to examine the empirical evidence once again with two related objectives:

1. Identification of existing sources of inefficiencies.
2. Estimation of the increases in income per capita which could be attained if these inefficiencies were eliminated.

It is obvious from the limited scope of this paper that the second question cannot be answered rigorously. We therefore only attempt to provide some indication about the relative size of some of the observable inefficiencies. The analysis will only consider partial improvements which could be obtained by a better organization of financial markets. Before turning to these empirical questions in the following chapter, we first develop some further evaluation criteria for judging the performance of a developing nation. To this end, we shall briefly discuss the conditions for optimal economic growth.

CHAPTER IV

SOME EMPIRICAL NOTES ON OPTIMALITY AND EFFICIENCY IN THAILAND

A. Introduction

The last two chapters analyzed the relationship between money, financial markets, and growth. On *a priori* grounds, no direct feedback effect between an efficient financial system and rises in the savings rate could be proven to exist. Our hypothesis about the growth inducing effects of money and finance, formulated as a', b' and c' in Chapter I, was thus refuted. Since savings are a crucial determinant for the rate of growth,[1] it follows that policies aimed at optimizing growth rates should first consider the level and rates of existing savings and compare them with desired rates. If actual rates fall short of the optimal efficiency considerations of the existing saving-investment sector in general, and of financial institutions in particular, become of relatively lesser policy importance. Put differently, the expected rates of return from expanding and/or improving the efficiency of the existing financial sector may then be less than for investments in alternative production possibilities which induce rises in the savings ratio.

This concluding chapter will, therefore, establish a working definition of optimality and of its implications for the desired short- and long-term savings rate. Should the data suggest, then a significant

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[1] This obviously does not hold for equilibrium growth rates in a neo-classical system.

discrepancy exists between observable and optimal savings rate, we would know that expansionary policies in the financial markets would not have the highest priority rating for development planners. If empirical material on past economic performance can be interpreted as approximating desired growth and savings rates, the efficiency question would, however, rate high in terms of planning priorities.

From the total of four testable cases on optimality and efficiency:

1. Optimality-efficiency
2. Optimality-inefficiency
3. Suboptimality-efficiency
4. Suboptimality-inefficiency

we thus want to determine the alternative which characterizes the existing situation in Thailand best. In accordance with policy priorities, we first test for optimality, assuming efficiency prevails in all markets. The result serves as a basis for the subsequent efficiency analysis, which is restricted to the financial sector.

Surprisingly, we found a relatively close correspondence between the savings rate in Thailand and that which we defined optimal. This result, together with the knowledge that bliss, i.e., alternative (1) does not exist, allowed us to identify the Thai situation with the second hypothesis. Estimating the existing inefficiencies for the financial sector, indicated that substantial gains in terms of aggregate output could be achieved, if money and financial markets were operated efficiently.

With respect to policy, the elimination of inefficiencies furthermore acquires great practical significance.

B. Objectives

The objectives of development planners regarding the saving investment process is assumed to be the maximization of the stream of real consumption over time. Two major issues need to be resolved before the criterion or objective function can be specified -- assuming that technological or supply conditions are known with certainty over time:

1. The relevant time horizon for the planning period;

2. The value judgments concerning the explicit or implicit utility (social welfare) function.

The literature[2] presents a number of alternative types of optimal growth models. These different approaches can best be shown in a simple chart:

		TIME HORIZON	
		Finite	Infinite
UTILITY FUNCTION	No explicit use	Turnpike	Golden Rule
	Explicit use	Pontryagin Path	Modified Golden Rule

The optimization problem generally consists of maximizing consumption over time given the production conditions. The instrument or policy

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[2]For further extensive bibliography, see E. Burmeister, A. R. Dobell, *Mathematical Theories of Economic Growth* (London: Macmillan, 1970), pp. 325-420.

variable is usually the savings ratios and the state variable(s) are the capital intensity(ies) "k". The value of all other variables can be determined once the optimal values of s and k are found.

The now well-known results for the Golden Rule state that capital accumulation should proceed at a rate such that the marginal productivity of capital f'(k) equals the rate of interest, or

$$f'(k) = r = \Lambda$$

where Λ = natural rate of population growth. This rule is optimal only as long as future utilities are not discounted. If they are, we obtain the generalized or modified Golden Rule results:

$$r^* = \bar{p} + g = \Lambda$$

with $\bar{p}$ = individual rate of time preference. The optimal rate of interest thus needs to be higher than the growth rate g whenever future consumption is valued less than present consumption. Hence, savings are also less under the modified Rule. If labor augmenting technological progress is present, two additional factors have to be taken into account: the rate of technical progress itself and the degree of homogeneity of the utility function. It has been proven by Phelps and Mirlees[3] that an

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[3]E. S. Phelps, *Golden Rules of Economic Growth* (New York: W. W. Norton, 1966), pp. 69 ff; J. A. Mirlees, "Optimum Growth When Technology is Changing," *Review of Economic Studies*, Vol. XXXIV (1967), pp. 93 ff.

optimum path exists only if

$$\alpha + \bar{p} \geq b$$

where

α = elasticity of utility,

b = labor augmenting progress factor.

This condition must be satisfied for the convergence of the utility integral. If utility is not discounted sufficiently, no optimal policy can be derived. Combining these results, it can thus be seen that a necessary condition for the existence of an optimal trajectory is that the interest rate cannot be lower and thereby saving and capital intensity not higher than in the original Golden Rule. In this sense, it can be considered as a separatrix[4] or dividing line between dynamically efficient and inefficient growth paths.

If the time horizon is finite, the results are less clear-cut: they depend on the planning period, the initial capital endowment, and the desired capital intensity at the end of the time horizon. Generally, it can be said, that the longer the planning period, the more closely the system will arch toward the Golden Rule and the longer it will stay in its neighborhood.[5] However, if the time horizon is relatively short

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[4] P. A. Neher, *An Introduction to the Theory of Optimal Economic Growth* (Unpublished manuscript), University of British Columbia, 1969.

[5] Burmeister and Dobell, *op. cit.*, p. 318.

and the target capital intensity smaller than the equilibrium optimal value, a movement towards the optimal path may not be desirable.

With the knowledge of the above the answer to our initial two questions, i.e., finding the relevant time horizon and utility function, becomes a little easier. Recall that our framework is that of a developing country, which is assumed to have a number of stylized facts: a low capital intensity, a low savings rate and thus a high level of interest rates, a high rate of population growth, low per capita incomes and consumption levels. For simplicity's sake and to retain comparability with the outlined model, the rather unrealistic assumptions must be added that full employment and competitive equilibrium conditions prevail in all markets and that population growth is exogenously determined. Some of these assumptions will be relaxed below. For now we shall take them as given. The question is thus: what decisions can we expect and/or should we recommend to the planning authorities concerning the time horizon of their planning periods and the shape of the social welfare function. If the intention is to formulate a long-term reference framework, the Golden Rule (or its modified version) with infinite time horizon is probably the best choice. Furthermore, zero time discounting seems preferable to any positive rate of time preference since the latter would not only retard the accumulation process but also imply a lower boundary to the optimal capital intensity. Furthermore, an infinite time horizon without discounting appears more reasonable on equity grounds than any arbitrarily selected time period and rate of time preference. If the future is discounted at a single positive rate, retaining the assumption of an infinite horizon, it must be assumed that future generations would have identical

preferences with respect to present and future consumption. Put differently, the degree of myopia reflected in the positive rate of discounting must remain unchanged at all times. With zero discounting we still have the implicit assumption of constant preference functions but the solution seems somewhat less restrictive and arbitrary: the problem of choosing an optimal saving policy in which many of those affected are not able to vote because they are not born yet is solved by giving future generations the same weight as the present.

As to the formulation of the utility function there are two main alternatives: aggregate or per capita utility functions. The former seems more adequate for overall policy and social welfare planning. Both concepts can be reconciled if they are formulated in the following way:

$$U = \int_{t=0}^{t=\infty} e^{-p} L(t)\, u[c(t)]\, dt$$

$$U = \int_{t=0}^{t=\infty} e^{-\bar{p}}\, u[c(t)]\, dt$$

These two formulations can be used interchangeably bearing in mind that the value of the discount rates differs by the rate of population growth.

$$\bar{p} = p - g$$

If positive weighting by population offsets the negative weight of time preference, the effective social discount rate could be negative. It will definitely assume a negative absolute value if $p = 0$ and $g > 0$.

The problem then is to find an appropriate converging criterion functional. We know[6] for $\bar{p} = 0$ that if the absolute value of the marginal utility function is equal to or exceeds one, convergence is warranted. We shall assume an elasticity value of $E > 1$ for two reasons. First, it appears in line with empirical research on the subject,[7] and secondly, it provides us with the desired result that the optimal savings rate is not lower than the one prescribed by the Golden Rule.

We are now able to summarize the above by specifying the criterion functional as:

$$U = \int_{t=0}^{t=\infty} L(t)\, u\left[\frac{c(t)}{L(t)}\right] dt$$

where $U(c) = \log c$ and $L(t) = L(0)\, e^{gt}$; $g = \Lambda + b$, b = labor augmenting progress, or more simply

$$U = \int_{t=0}^{t=\infty} e \log c \, dt.$$

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[6] B. S. Frey, "Eine einfache Eipfuehrung zu Pontryagins Maximum-Prinzip im Wirtschaftswachstum," Sonderdruck, *Weltwirtschaftliches Archiv*, (Band 103, 1969), p. 227.

[7] Empirical results on the issue are rather sharply diverging. Mera found an elasticity value of -0.05-0.25 while Fellner computed the marginal utility elasticity as -1.5. The value of -1.00 appears as reasonably midpoint between the two estimates. K. Mera, "An Empirical Determination of A Dynamic Utility Function," *Review of Economics and Statistics*, Vol. L (1968), p. 117; W. Fellner, "Operational Utility: The Theoretical Background and Measurement," in *Ten Economic Essays in the Tradition of Irving Fisher* (New York: 1967), quoted in Frey, *Ibid.*, p. 226.

This formulation implies for the optimal path:

$$s^* = \bar{s}$$

$$\bar{p} = 0$$

$$f'(k) = \bar{r}$$

$$r = g$$

where

s^* = the optimal Golden Rule savings rate;

s = the efficient attainable savings rate given the target and the constraints.

If planners are instead concerned with specific short-term plans the infinity assumption would clearly be irrelevant. However, this should not imply that short-term optimal path moves away from the Golden Rule path. It is more plausible that they will approach it in stepwise fashion through a number of appropriate short-term plans.

For underdeveloped countries this presumption may not hold true. They may require a period of "overshooting" of the Golden Rule equilibrium values at the present stage, if they have a strong preference for increasing the aggregate capital stock and eventually catching up with the industrialized nations. The choice of the Golden Rule implies that accumulation beyond the equilibrium values for capital intensity and savings ratio is dynamically inefficient. When the planning period is finite and thus a terminal data of decumulation allowed for, savings in excess of the Golden Rule rate can be efficient. They will be if the benefits of the final decumulation outweighs the sacrifices of initially foregone consumption. With rapidly growing populations this condition is likely to be fulfilled. We could thus conceive of movements such as

$$k_{t_o} - k_{t_n}$$

and

$$k_{t_n} - k_{t_{n+m}}$$

where

$$n + m \leq \infty$$

as illustrated in Figure 4-1 below.

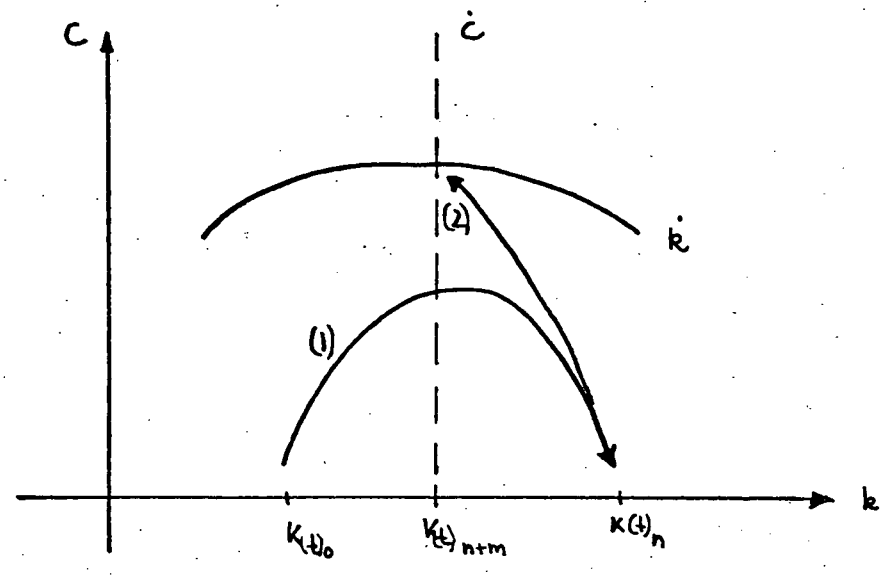

Figure 4-1

We can therefore redefine the range of permissible and desirable values for the optimal savings rate as

$$\bar{s} \geq s^*$$

where

$\bar{s} = s^*$ holds for an infinite time horizon and $\bar{s} \geq s^*$ for optimal finite plans.

This information can now be used to examine existing empirical evidence on savings rates in Thailand. Although a further narrowing of the range of values for the savings rates would have been preferable and necessary for a rigorous test, the above provides a sufficient condition for illustrating Thai economic performance.

C. Empirical Evidence About Optimality and Efficiency in Thailand

The problem is to determine whether or not existing savings could also be interpreted as optimal, given the previous assumption about modified Golden Rule optimality (including a labor augmenting progress factor). The allocation of actual savings and investment is assumed efficient for the time being. The same condition is imposed on the performance of all other markets.

Restating the equilibrium conditions from above, we have:

$$g = f'(k) = \Lambda + b + a\bar{p}$$

where

$a = -1$ and $\bar{p} = 0$ are assumed values.

The optimal conditions for the savings and investment markets are:

$$s^* = \frac{\dot{K}}{Y} = \frac{r\dot{K}}{Y} = f'(k)\frac{K}{Y}$$

The Thai data can now be compared with the above equilibrium conditions; the data are averages from a period of 10 years from 1959 to 1969.[8] The following statistical information is readily available:

$$g = 0.08$$

$$\Lambda = 0.0025$$

No compiled data exist for the rate of return on capital or the savings ratio. Their value is approximated as[9]

$$s = 0.20$$

$$r = 0.08$$

What values can be reasonably imputed to the rate of technical progress and the capital output ratio? For the equilibrium conditions to be satisfied they would have to assume values of b = 0.055 and for the imputed capital output ratio of 2.5.

An exogenous progress factor of 5.5 per cent annually seems rather high at first sight. However, it appears to be within tolerance interval for a developing nation where the rate of technical progress can be

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[8] All data are obtained from *Bank of Thailand*, Monthly Report, Vol. X (January 1970).

[9] The data on population growth and the real growth of national output can be assumed as relatively accurate estimates. The savings rate could only be approximated from the share of gross capital formation in GNP over the stated period. As closest proxy for the yield on physical capital the central bank loan rate was selected.

expected to exceed those of industrialized nations. The same can be said about the capital output ratio: if the ratio of financial wealth to real physical wealth hovers around 15 per cent[10] and financial wealth[11] ranges from 30 to 35 per cent of national product (the ratio is increasing over time), we can derive a series of estimates for the aggregate capital stock and thus the capital output ratio of roughly 2 to 2.5.

The estimates suffer from too many serious shortcomings to be discussed in great length. The noteworthy point is, however, that a first cursory examination of the data suggests that present savings rates may well be close to a long-term optimal level. In accordance with our previous conclusions, we could, then tentatively say that a target rate of savings which exceeds the present level may be desirable presumably for shorter term plans. Alternatively, if present rates fall short of the optimal target (case of 5-2) a raising of the rate is called for until the optimal level is reached. For shorter term planning actual rates may even exceed this optimum as was shown above.

To sum up: under assumed efficiency conditions for the operations of the savings-investment markets we find $s_T \leq s^*$ optimal.

The above evidence indicates that Thailand's savings rates may be close to the long-run optimal level. It appears, therefore, more

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[10] Assuming that only banks hold financial assets.

[11] R. W. Goldsmith, "The Determinants of Financial Structure," *Organization for Economic Co-operation and Development*, Study No. 2, 1965, p. 2.

important to focus on those observable economic factors which could account for inefficiencies in the operations of the financial saving-investment sector. An examination of all possible sources of inefficiencies in this single sector clearly exceeds the scope of this paper. We shall thus discuss only a few selected indicators to determine the operational efficiency of the money market and financial institutions.

Efficiency in the financial sector is defined as:

1. Efficient administration of the means of payment by the central bank and commercial banks;[12]

2. Efficient provision of credit for capital formation.

As pre-requisite for studying the second question, we have to determine the relative size of the organized financial sector, i.e., commercial banks, versus the size of the unorganized sector, i.e., private money lenders, pawnbrokers, etc. If available evidence suggests that the unorganized financial markets are relatively large, their operations must be examined together with those of commercial banks.

As major theoretical sources of inefficiencies we have:

(a) non-competitive market structures;

(b) externalities in the form of production or consumption economies or diseconomies. Generally, cases of market failure are due to the divergence between private and social valuations;

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[12] Commercial banks are the only institutions operating in the organized part of financial markets in Thailand.

(c) inefficient, although competitive organization of production in terms of known technological alternatives, i.e., for given quantities of outputs a reduction in production costs is possible if efficient techniques are implemented;

(d) institutional inefficiencies.

The observable inefficiencies in the financial sector will be compared and classified in the above three categories. For simplicity's sake, the *ceteris paribus* assumption for efficiency in all other markets is maintained throughout the discussion. It allows us to add up individual estimates of inefficiencies and to compare their total to national otuput and investment data. In this way, we hope to obtain an indication of the potential aggregate output increase that could be achieved if the financial markets operated more efficiently.

D. Efficiency in the Money Market

The money supply is provided by two types of financial institutions: central and commercial banks. We first examine the operations of the central bank, defining efficiency as the minimization of costs of supplying the means of payment. We assume that the domestic currency could be produced at total costs which are sufficiently small to be approximated by zero. For international payments, we add the assumption that the amount of required reserves should not fall below the deficit in the balance of payment in one year.[13]

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[13] Excess reserves are thus defined as the difference between the minimum amount of required reserves and the quantities of reserves actually held per period.

In Chapter II the conditions for an optimal provision of money under a commodity standard were derived. We know from there that as long as production costs of money are positive, the size of the money supply is not immaterial. The quantity of money not only affects the price level and thereby other real variables in the economy, but also the level of total production. In the following, we shall try to determine whether the Bank of Thailand supplies given quantities of money at minimum costs. If available evidence indicates that observed costs exceed the necessary minimum we shall try to estimate the increments in total production which could be attained if the same quantities of money were provided at minimum costs. Furthermore, the question should be examined whether the actual quantities of money supplied exceed the quantity necessary for an efficient operation of the money market. Put differently, the identification of large cash hoards together with greater than minimum money costs would suggest that the actual money supplied was too large and thus inefficient.

Data on the monetary reserve holdings of the Bank of Thailand in relation to trade flows, Gross National Product, and aggregate investment for the period from 1957 to 1963 are illustrated in Tables IV-1 and IV-2 on the following pages. The first table clearly shows that excess quantities of monetary reserves in the form of gold and international reserve reserve currencies are held by the Bank of Thailand for all years examined.

TABLE IV-1

RESERVE HOLDINGS OF THE BANK OF THAILAND IN RELATION TO TRADE FLOWS AND GROSS NATIONAL PRODUCT FOR THE PERIOD 1957 to 1967

IN MILLIONS OF BAHT

YEAR	(1) EXPORTS	(2) IMPORTS	(3) GNP	(4) GOLD	(5) INTERN. RES.	(6) TOTAL (4) + (5)	(7) TRADE DEF.
1957	7.54	8.53		2.24	3.15	5.40	.99
1958	6.44	8.23		2.26	3.05	5.30	1.79
1959	7.56	8.98		2.08	3.11	5.20	1.42
1960	8.61	9.62		2.08	3.71	5.80	1.00
1961	9.99	10.28		2.08	5.40	7.48	.29
1962	9.52	11.50	68.92	2.08	6.79	8.87	1.97
1963	9.67	12.80	68.92	2.16	8.29	10.46	3.12
1964	12.33	14.25	73.73	2.16	9.58	11.74	1.94
1965	12.91	15.43	81.27	2.00	11.14	13.15	2.49
1966	14.09	18.50	96.80	1.90	14.89	16.80	4.40
1967	14.16	22.18	105.63	1.90	16.76	18.67	8.02

SOURCE: Bank of Thailand, *Monthly Bulletin*, Vol. X (January 1970), p. 6, p. 34, p. 90. The total in column (6) and the balance of trade in (7) are rounded figures as given by the Bank of Thailand.

TABLE IV-2

RELATIONSHIP BETWEEN TOTAL MONETARY RESERVES, THE BALANCE OF PAYMENTS FOR 1957-1967, AND INVESTMENT FOR 1963-1967

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
(6)/(7)	5.4	2.99	2.99	5.8	25.9	4.50	3.35	6.14	5.28	3.81	2.32
(6)-(7) MB	4.41	3.51	3.78	5.80	7.19	6.90	7.34	9.83	10.66	12.40	10.65
Total Investment (8) MB							14.96	16.94	19.15	23.13	26.74
[(6)-(7)]/(8)							49%	58%	56%	53%	40%

SOURCE: Bank of Thailand, *op. cit.*, and p. 91.
Data on Investment not available prior to 1963.

MB = Millions of Baht

Now assume that the total surplus of monetary reserve balances, as defined above, could be used to increase aggregate domestic investment output. Table IV-2 then shows by how much the level of total investments could have been raised for each year individually. While these percentage figures indicate the relative magnitude of excess reserves in terms of an annual investment loss, they do not show the aggregate effect for the whole period.

A crude estimate of the total opportunity costs of these excess reserves can be obtained by summing up all past excess balances and comparing them with the required reserves for the same period. For 1957 to 1967 the costs of these reserves are then found to amount to 81.44 million Baht. This equals roughly three times the aggregate amount of investments for 1967 or 80 per cent of GNP for the same year. For the single year 1967 the relative share of excess reserves amounts to 10 per cent of the current GNP. For a more accurate computation of the aggregate increase in production that could have been attained if the level of reserves were always kept at the minimum level, it is important to know how these reserve savings would have been used. If they were entirely channelled into investment or for the import of capital goods the total effect would be greater than if these funds were used to finance increases in consumption.[14] We shall leave out all these considerations and thus compound interest yields on investments foregone, and rather thereby understate the value of the potential gain.

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[14] A simple multiplier calculation of the total increase of GNP (calculated for each year separately and the results for the 11 years added together) would, however, be identical for consumption or investment.

This can be done because the findings unquestionably demonstrate that the Thai authorities are not providing money with maximum efficiency. Since we were looking for an indicator for the relative size of the opportunity costs and not a precise estimate, the above approximation procedure is sufficient. It would not have been had the data not so clearly pointed to the existence of inefficiency in the provision of money.

This observed inefficiency would not disappear even if one allowed for somewhat increased reserve holdings. Since it is practically impossible to match reserve holdings precisely with balance of payments deficits for every year, policy makers may not want to decrease reserve holdings to the minimum level we assumed feasible. However it is an open question whether the costs for holding negative excess reserves, i.e., for not being able to meet all trade payments as they become due, is not less than the marginal gain via increases in domestic production. It appears quite likely that a thorough study of the costs and benefits involved would show that a certain average of negative excess reserves are less costly and thus more efficient than an average of positive reserves. Implicit in our results is the assumption of zero gold and international reserve currency backing of the domestic money supply. This point was purposely left unmentioned thus far. We want to emphasize that there is absolutely no economic reason why an economy should hold reserves on this account other than to meet trade obligations. Beyond those, nothing can be said in favor of the long cherished tradition to hoard gold and international reserve currencies. Any government's ability to tax plus the aggregate wealth and output of a country provides sufficient security for

the value of its currency, provided the money supply is efficiently administered.

It should, therefore, be impressed upon authorities in all countries, particularly in developing nations which complain about their lack of funds, that the hoarding of reserves is a non-sensical convention. Every unit of excess reserves beyond the required minimum has a positive cost in terms of lost output.

We shall now briefly discuss the implications of our findings for cash hoards. With the knowledge of large positive excess reserves, it is obvious that cash hoards are costly and thus inefficient. As long as an economy like Thailand adheres to a policy of partially backing its domestic currency by gold and international reserve cash hoards are undesirable. By hoarding we mean the holding of money for other than transactions purposes, i.e., for precautionary or speculative motives. Hoards may be privately efficient if the marginal benefits derived from them equals their costs in terms of interest foregone. Socially, they are clearly undesirable, since they imply the loss of productive investments.

To illustrate: assume a country's trade flows are always balanced and that its prescribed reserves against the money supply are 20 per cent, which could be used to increase investments. Furthermore, take the production costs of money supply as zero. It then follows that every unit of money held in excess of current transaction needs has an imputed social cost of .2 of the nominal price of money, if held for a single time period. The social costs increase with the length of time, for which hoards

are held. Generally, the following chain effect will thus hold: the larger the size of cash hoards, the greater the equilibrium money supply, the larger the absolute level of required reserves and thus the relative misallocation of reserves.

An estimate of past cash hoards in Thailand is not necessary since our indicator about the potential output increase from the elimination of excess reserves implicitly takes account of the output loss due to past hoards. A determination of their relative size would only be important if it is unlikely that present currency reserve requirements will be changed for the central bank. Should this institutional constraint remain, it would be the responsibility of the policy maker to estimate the magnitude of hoarding for determining the socially efficient money supply.[15]

The evidence thus far indicated that the source of the observed inefficiency appears to be institutional. It could be eliminated if appropriate provisions in the existing legal structure were made. Next, we shall examine the commercial banks' efficiency in their provision of the means of payment function.

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[15]Some authors assign relatively little importance to the phenomenon of hoarding. Higgins, for example, claims that there is a significant difference between the economic effects of cash hoards over other forms of hoards such as jewelry, livestock, etc. He asserts that monetary authorities could increase the money supply by the estimated amount of these hoards to finance investment projects without creating inflationary pressures. The macroeconomic results would be the same as if the money had been deposited in the banking sector in the first place. Higgins, *op. cit.*, p. 279. This conclusion obviously does not hold. Although increases in the money supply may not create inflationary pressures, they are costly in terms of reserves. The required reserve ratio could be seen as an addition to the investment costs or a lowering of its expected return.

As a criterion for evaluation we assume that the spread of banking offices in a country should correspond to the population distribution. This assertion appears reasonable because the number of economic transactions, productive investment opportunities, and thus credit demand seems positively related to the density of population. Should the evidence point to a significantly uneven distribution of bank branches throughout the country, the banks performance could not be considered to be socially efficient.

Inspection of the data on the distribution of branch banks and population for 1965 (this information is reproduced in the Appendix as Appendix 1) showed a strikingly low correlation between the two variables. As to be expected, the greatest density in bank offices was found for the Bangkok area where the average number of people per bank office amounted to 11,000. For rural highly populated areas this figure varied roughly between 50,000 and 250,000 per branch. The least populated areas were found to have as little as one office per 600,000 people. It is clear from these data that banks are not only highly unevenly distributed but also far from ubiquitous available. Since this latter factor represents a precondition for efficiency in exchange we can therefore conclude that commercial banks performance appears socially inefficient.

Additional statistical material together with Rozenthal's[16] analysis on branch banking in Thailand suggest that commercial banks

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[16] A. A. Rozenthal, "Branch Banking in Thailand," *Journal of Developing Areas*, Vol. III (October 1968), pp. 37-51.

view their branches primarily as means of collecting resources from the countryside and transferring them to the capital. From the point of view of the individual bank, such a decision presumably reflects profit maximizing behavior. It is, however, socially undesirable. The source of the inefficiency could partially be seen in a market failure, because private and social valuations differ although the commercial banking sector seems competitively organized. Institutional factors provide a second possible explanation for the inefficiency in so far as existing laws do not give sufficient incentives to banks to open more branches in the country.

An estimate of the aggregate benefits attainable from a more even and dense spread of banking offices could not be made directly. An indirect answer is attempted in the next section on the unorganized money market. Costs for financial services in the unorganized market above those charged by commercial banks are considered as the benefits foregone from the existing lack of banks. Before we can discuss this question, we need an estimate on the relative size of the unorganized financial sector. This estimate serves furthermore as necessary introduction for the discussion of the second point above, i.e., the commercial banks efficiency in the provision of credit for capital formation.

For estimating the relative size of the unorganized financial sector it is assumed that the flow of currency transactions is conducted primarily in this market while transactions settled by cheques are done in the organized financial sector. The size of the unorganized market, and thus by implication, that of the organized financial institutions is measured by calculating the ratio of currency held by the public

to total money supply over time and the ratio of domestic bank credit to national income. While this assumption lacks accuracy, it should be useful as a first indicator,[17] especially when compared with the data from other countries. It is furthermore the pre-requisite for the calculation of the aggregate output loss due to the excessive transactions costs incurred in the unorganized financial market (compared to those in the organized sector).

The two charts on the following page show these ratios for Thailand and for the years 1954 to 1967. They illustrate that the percentage of currency held by the public amounted to approximately 70 per cent in 1954 and declined steadily thereafter to about 55 per cent in 1967.[18] This implies that the relative size of the unorganized sector remains rather large although of somewhat declining importance. The inference was confirmed by comparing the Thai data with those of the United States for some years of the same period. The U.S. ratio of currency to money supply remained almost constant at about 20 per cent of the total

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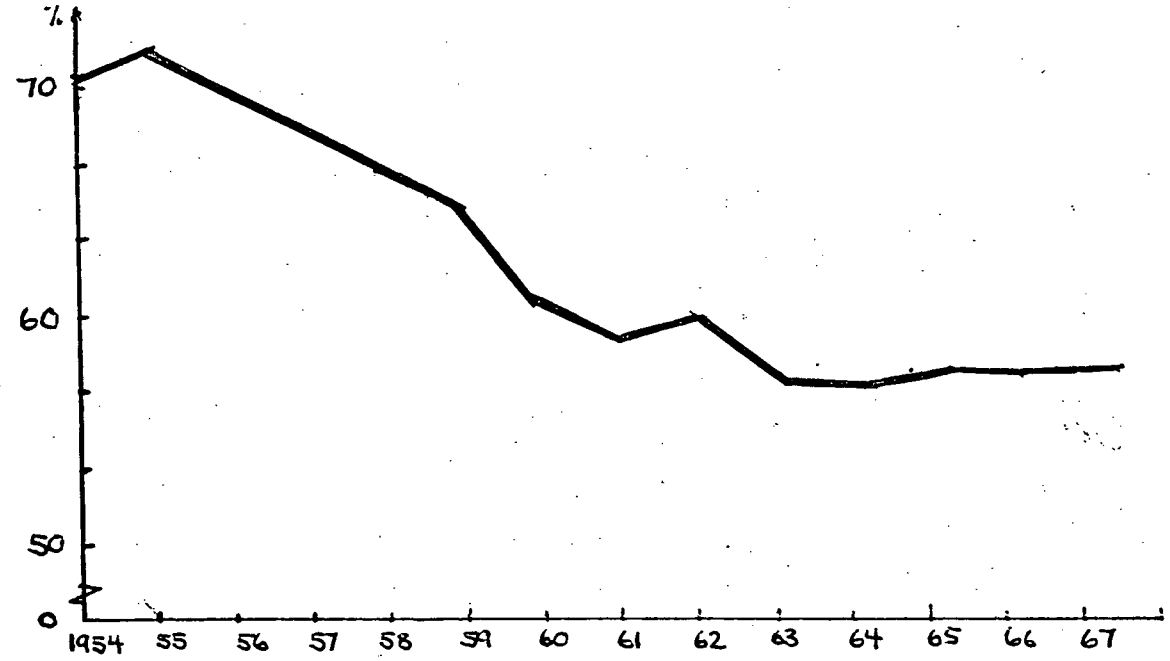
[17] Both markets are in part competitive and complementary. Money lenders as well as borrowers in the unorganized money market may use chequing accounts, thus inflating the ratio attributed to the organized sector. On the other hand indices related only to commercial banks performance somewhat understate the contribution made by the total organized sector.

[18] Our estimate presumably understates the size of the unorganized financial market considerably. Rozenthal's work report on the "Sources of Urban Credit for Ongoing Purposes" shows that the relationship between funds from commercial banks compared to those of other sources amounted to only 40 per cent for 1965. The ratio for sources of initial capital provided by the banking sector compared to other sources is considerably smaller yet; it was five per cent only in 1965. A. A. Rozenthal, "Financing Thai Business Enterprise," *op. cit.*, p. 45 and p. 54.

CHART IV-1

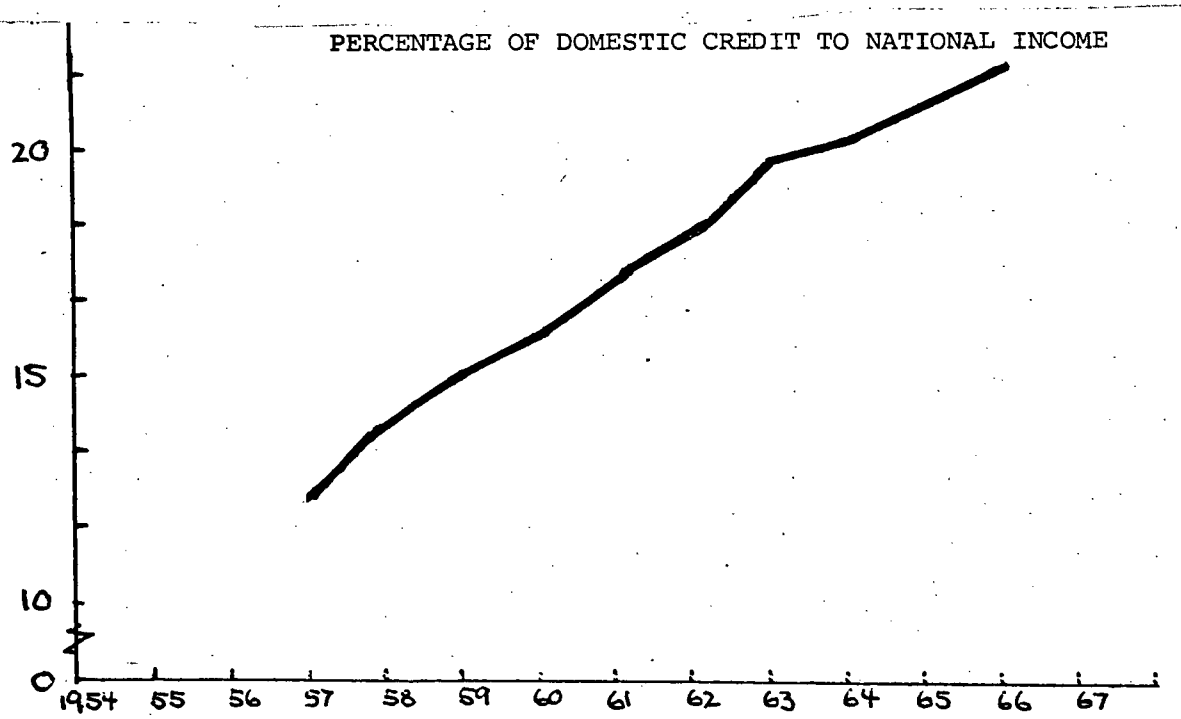
PERCENTAGE OF CURRENCY HELD BY PUBLIC TO MONEY SUPPLY



SOURCE: Bank of Thailand, *Monthly Report* (December 1967), p. 4.

CHART IV-2

PERCENTAGE OF DOMESTIC CREDIT TO NATIONAL INCOME



SOURCE: Bank of Thailand, *Ibid.*, pp. 8-9, 72; *International Financial Statistics*, Vol. XXI (October 1968), pp. 298-301.

money supply.[19] The same results was found for the United Kingdom. On the other hand, developing nations broadly comparable to Thailand, showed similarly high ratios for their currency holdings, which suggests that the situation in Thailand seems at least somewhat representative.

As to the percentage of domestic credit to national income the chart demonstrates a steady increase of this ratio. It thus supports the above finding of a relative extension of the scope of organized financial institutions. From about 13 per cent in 1957 (the first year for which statistical information was available) the credit ratio rose to slightly over 20 per cent in 1967. On a comparative basis, these data do, however, indicate that Thailand's supply of bank credit is presumably less than for similar developing countries. For the latter, the credit ratio was generally found to vary between 20 to 40 per cent, while it amounted to a constant average value of 60 per cent for both the U.S. as well as the U.K. Both ratios indicate that the unorganized financial sector is still relatively large, even if the extension of the contribution of organized financial institutions is taken into account.

Next, we need an estimate about the absolute size of the unorganized money market. It could be obtained if one subtracted the United States' ratio of currency holdings from the Thai percentage figure. This procedure appears justifiable on the assumption that unorganized financial markets appear non-existant in the United States. The percentage

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[19] Details on comparable data for currency and credit ratios are shown in Appendix 2 of the Appendix. The figures were compiled from *International Financial Statistics*.

of currency held in the United States should, therefore, reflect the minimum currency holding necessary after the monetization process is completed, i.e., a widespread network of commercial bank established. Using this assumption we find that the relative size of the unorganized financial sector amounted to about 50 per cent in 1954 and declined to 35 per cent until 1967. In absolute terms this implies that 2,466 million Baht were held in the unorganized sector at the beginning of the period compared to 3,907 million Baht at the end of the period.

Now assume that the transactions velocity is identical for both sectors. It would then follow that 50 to 35 per cent of the aggregate volume of transaction were made in the unorganized money market. This last assumption only serves as a first approximation, since it is certainly not realistic to assume that both velocity figures are the same. One would expect that the velocity of funds deposited with commercial banks exceeds that of cash holdings by a significant margin.[20] Data on total transactions for each sector or for the whole economy, and thus information about the transactions velocity was not available. As proxy for overall velocity, we therefore used national product data. For the estimate about its relative magnitude in both financial sectors we could only make an intuitively plausible assumption. On this basis we calculated the modified estimate of total transactions in the unorganized

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[20]For that part of cash holdings which is hoarded, the transactions velocity would be zero or close to it.

money market, taking the value of velocity in this market as half that of the overall average.

It was found that 10,000 to approximately 16,000 million Baht in 1967 were used primarily for financing transactions in the unorganized sector. This estimate appears relatively conservative because the total volume of transactions clearly exceeds the value of national production on which the estimate was based. This last indicator can now be used to estimate the benefits lost in terms of foregone production.

Take the transactions costs for those exchanges performed in the organized financial markets as representative of the costs incurred by using cash. The benefits of chequing accounts can be seen as the service of the bank rendered in return for obtaining deposit funds. This yield on a demand deposit or alternatively the costs of using cash could be approximated by taking the return on highly liquid, short-term time deposits, which amounts to six per cent per annum in Thailand.

A rough indicator for the social costs of using cash can thus be derived by multiplying the total quantity of cash holdings by the yield foregone.[21] For the year 1967 for which we estimated the relative size of cash balances in the unorganized financial market the inefficiency coefficient then amounts to 600 to 960 million Baht. This represents

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[21] An additional argument could be made which would increase the value of the inefficiency indicator further. Depositing cash with the financial institutions leads to a potential expansion of credit of the amount of cash deposited times the desired deposit multiplier. This follows only if the authorities did not allow for an expansion of credits by the estimated quantity of hoards.

approximately five to eight per cent of GNP for this year. Together, the observed inefficiencies in the international reserve holdings and the size of cash held in the unorganized market add up to about 15 to 18 per cent of GNP for 1967. With due allowance for errors, this magnitude is significantly large to permit the conclusion that sizeable inefficiencies exist in the provision of money in Thailand.

E. Efficiency in the Provision of Credit

In the following section we want to examine the question whether the existing financial system is efficiently providing credits for capital formation.[22] Analogous to the previous section we try to estimate the relative size of observable inefficiencies in terms of output lost for both the organized and unorganized financial sector. The efficiency in the provision of credits is clearly related to the efficiency of administering the means of payment, since both are merely two sides of the aggregate balance sheet for the financial sector. Given the widespread lack of banking facilities and thus a relatively large unorganized financial sector, it can already be inferred that overall maximum efficiency does not exist. The magnitude of the inefficiencies will now be estimated for the unorganized financial market. It should again be emphasized that the estimate has only tentative character.

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[22] An estimate about the relative size of inefficiencies in the provision of the existing volume of credits by commercial banks is not derived since these markets appear to operate under competitive conditions.

For deriving an approximate measure of existing inefficiencies in the provision of credits we need statistical information about the interest rate structure and the aggregate volume of credits and their uses. Our measure for the unorganized financial market is based on the assumption that the existing total volume of credit for productive purposes could be provided by commercial banks. We want to determine for a single year what the competitive loan charges for a given aggregate amount of loans would have been and compare this figure with the interest payments actually incurred in the unorganized market. The difference then represents a measure of the resources which could have been saved by a more efficient organization of the financial sector. A prerequisite for our estimate is an explanation of the observable interest rate differential between the two financial markets. It has to be shown what proportion of this differential is attributable to risk, and/or monopoly rents, and technical production cost differences.

For this purpose, the following assumptions are made:

1. Economies of scale exist in the provision of financial services, which are not used in the existing unorganized financial market because of the smallness of individual money lenders' operations.

2. The organized and unorganized financial sector are entirely separated.[23] Although not strictly true, the

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[23]The agricultural sector and small scale service and trade businesses are assumed to be serviced by the unorganized financial market. A. A. Rozenthal, *op. cit.*, p. 20.

the above evidence on branch bank operations justifies this approximation. By definition, borrowers in the unorganized financial market do, therefore, not have access to commercial banks. The non-existence of choice suggests a relatively large degree of inelasticity of the demand curve in this sector.

3. Private money lenders enjoy persisting monopoly positions. While freedom of entry theoretically exists, the non-competitive structure can presumably be maintained because of the high costs or low profit expectations for potential entrants. The effective barrier to entry for commercial banks appears to be the legal ceiling on loan interest rates, imposed by the Bank of Thailand. For potential non-bank competitors, the deterrent for entry may be, among other reasons, the relatively large profitability of alternative investments, geographical barriers, etc.

4. The average risk factor for providing credits in the unorganized financial market does not differ substantially from the risk faced by commercial banks. Although it is conventionally asserted that most, if not all of the interest rate differential can be explained by differences in risk, this argument does not appear convincing.[24] Risk premiums charged on a loan depend inversely

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[24] *Inter alia:* A. Bottomley, "The Premium for Risk as a Determinant of Interest Rates in Underdeveloped Rural Areas," *Quarterly Journal of Economics*, Vol. LXXVII (November 1963), pp. 637-47.

on the probability of default. The failure to repay a credit declines with increasing coverage of the loan by collateral. Available evidence on Thailand suggests that the relationship between loan demand and collateral is broadly similar for the agricultural and industrial sector. According to our specification above, the former is serviced by the unorganized financial market and the latter by commercial banks.[25]

Given these assumptions, the situation for a representative money lender can now easily be shown as illustrated in Figure 4-2.

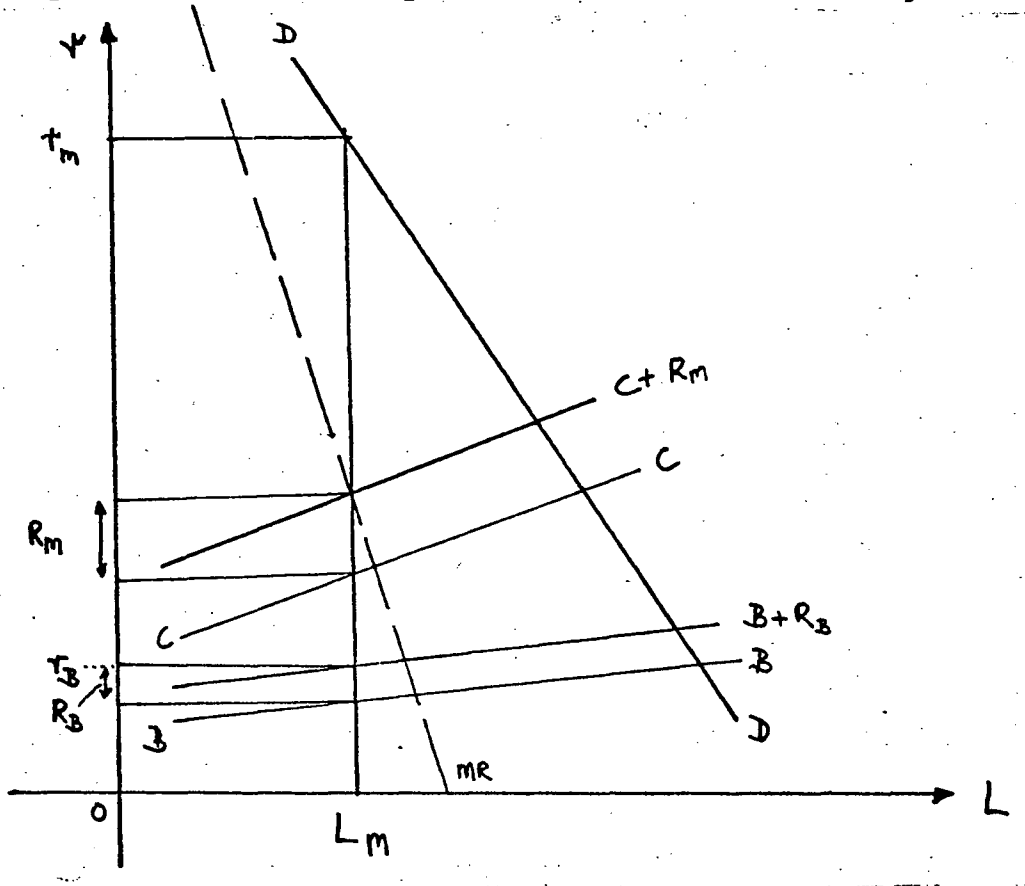

Figure 4-2

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[25]Sithi-Amnuai, *Finance and Banking in Thailand* (Bangkok: 1964), pp. 175 ff; A. A. Rozenthal, *op. cit.*, pp. 45-54. The liquidity of the types of collateral offered by agriculture and industry may differ. Land, which is relatively illiquid represents the primary source of collateral holdings in the commercial banking sector amounted to 60 per cent in 1965. (continued)

The loan rate charged on the given quantity of credits L_M is represented as r_M. The money lenders' cost curve, $C + R_M$ incorporates a proportional risk factor of R_B. The hypothetical cost curve for a commercial bank is shown as $B + R_B$ where the element R_B reflects the risk element which cannot be eliminated through pooling. Competitive banks could supply the same aggregate volume of credits, L_M, for the interest rate r_B. The difference between r_M and r_B shows the total interest cost savings due to the reduction in production cost, risk, and the elimination of monopoly rent. Multiplying this difference by the total value of loans then measures the size of the existing inefficiency in the allocation of resources for one time period.[26]

For estimating the misallocation of resources take the average commercial bank loan rate as 15 per cent per annum from the prescribed range of 12 to 18 per cent. Assume, in addition, that this rate reflects competitive production costs for the given volume of credits. The interest charges in the unorganized financial sector vary broadly between 40 and 60 per cent for productive loans.[27] As approximation,

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This figure indicates that even if money lenders charge negative liquidity premiums for agricultural loans it is unlikely that these are the sole cause for the observable interest rate spread.

[26] If interest rates would in fact be reduced to the level of competitive cost it is obvious that total loan demand would also increase. This secondary effect will enhance the primary benefit of resource savings.

[27] Our data are based on Rozenthal's findings who conducted extensive field research in Thailand. For the unorganized financial sector, he found interest rates ranging from two per cent per month to more than 10 per cent per month. The largest percentage rates appeared to pertain only to consumption loans. Manufacturers, small and medium businesses have to pay an average of 40 to 60 per cent interest per annum. See

we shall assume a value of 50 per cent as the representative average. In accordance with previous arguments we shall attribute the relatively largest part of the interest rate differential between the two financial markets to monopoly rents. The rent element is thus taken to be an average of 30 per cent and the risk premium in the unorganized market as 10 per cent of which half can be eliminated by the pooling of risk. The remainder, or five per cent, is therefore assumed as the approximate percentage figure for the increase in riskiness for loans in the unorganized financial sector. It follows from these assertions that the same quantity of loans now supplied by money lenders could be provided by commercial banks for approximately 20 per cent interest per annum.

For an aggregate agricultural loan volume of 5.201 million Baht for 1967, the resource savings in the same year would have amounted to approximately 156 million Baht, or about one per cent of GNP for 1967.[28] Although this percentage figure appears rather small, it should be recalled that no account was taken of the compounded effect of the inefficiencies over time. Furthermore, our data on the loan volume of the agricultural sector understates the true value of productive credits and exclude consumption loans. However, even as little as one per cent is not insignificant in the context of a developing country like Thailand

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A. A. Rozenthal, *Financing Thai Business Enterprise*, Field Report No. 21, (Washington, D.C.: National Planning Association, 1968).

[28] Sithi-Amnuai, *op. cit.*, p. 179. Our estimate is an extrapolation of the increased value of agricultural indebtedness from 1955 to 1963.

because of the great scarcity of funds for productive purposes.

This concludes our observations on the efficiency with which the existing Thai financial system provides for the means of payment and for productive credits. We found clear indications that inefficiencies do exist and that significant gains would be obtained by eliminating them. It appears from the findings, that policy makers should concern themselves primarily with institutional changes, since the observed market failures seem conditioned by the existing set of legal constraints. It would be desirable to discontinue the practice of holding fractional reserves against the money supply in the form of gold or international reserves. Instead, only an efficient minimum amount of reserves should be kept for trade obligations. In addition, it was found advisable to reduce the size of the unorganized financial markets and thus by implication of cash transactions. Organized financial institutions should be given increased incentives to open offices in areas which are at present undersupplied with banking services. This would presumably imply a rise in the legal ceiling of interest rates on bank loans, to account for increased costs and risks of small rural branches. If existing laws cannot easily be changed, policy makers should consider the possibility of operating and/or financing bank offices wherever it appears socially desirable.

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APPENDIX 1

THE RATIO OF CURRENCY TO MONEY SUPPLY (A),
AND THE RATIO OF COMMERCIAL BANK CREDIT
TO DOMESTIC NATIONAL INCOME (B)
FOR SELECTED COUNTRIES

	A			B		
	In Per Cent			In Per Cent		
	1965	1966	1967	1964	1965	1966
Argentina	50	50	49	30	28	29
Bolivia*	79	76	75	16	17	18
Brazil***	19	22	19	49	45	43
Ceylon	53	53	54	38	40	41
Chile	38	39	40	27	28	26
Columbia	40	39	37	25	26	29
Cameroon****	50	55	54	8	10	11
Ethiopia (x)	72	73	70	6	6	7
Ghana (x)	48	46	46	19	20	24
Greece	71	70	75	45	48	51
India	65	65	70	29	31	30
Iraq**	79	78	78	16	18	21
Israel	34	37	37	25	25	30
Jordan (x)	54	52	67	20	20	23
Kenya*	--	20	30	--	12	14
Korea	54	60	63	14	17	17
Libya* (x)	50	50	49	8	9	8
Malaysia	56	54	51	16	16	19
Mexico	41	41	--	14	15	16
Morocco**	36	37	38	30	31	30
Nigeria*** (x)	63	61	64	6	9	12
Pakistan*	60	59	57	30	32	30
Paraguay*	60	58	57	18	21	25
Peru****	58	57	--	20	20	24
Philippines*	57	55	53	36	37	43
Sudan	55	58	56	1	5	10
Syria**	87	83	85	50	47	50
Tanzania	--	39	47	15	20	16
Thailand	57	57	55	20	21	21
Tunisia	34	36	35	57	58	70
Turkey*	69	69	70	41	43	44

APPENDIX 1 (Continued)

	A			B		
	In Per Cent			In Per Cent		
	1965	1966	1967	1964	1965	1966
U.A.R.*** (x)	70	65	64	49	52	53
Uruguay***	60	71	66	47	45	45
Venezuela*	32	33	32	20	20	20
Vietnam (South)**	70	70	73	28	34	40
West Africa***	55	54	52	11	11	12
Zambia	22	25	30	11	15	--

SOURCE: Compiled from *International Financial Statistics*, Vol. XXI (October 1968).

For Index B: *1965-67; **1963-65; ***1962-64;
(x) GNP figure substituted for NI.

APPENDIX 1

THAI COMMERCIAL BANKS -- THE DISTRIBUTION OF BANK BRANCHES AT THE END OF DECEMBER, 1965

CHANGWAD (PROVINCE)	POPULATION (CENSUS 1960)	NO. OF BANK OFFICES	BANK OFFICE PER 1000 POPULATION
(1)	(2)	(3)	(2) : (3)
Bangkok	1,577	142	11
Songkla (Haadyai Included)	500	20	25
Dhonburi	559	19	29
Trang	240	13	18
Chiengmai	798	13	61
Rajburi	411	12	34
Cholburi	392	12	33
Nakorn Sawan	648	11	58
Khon Kaen	844	10	84
Yala	149	10	15
Nakorn Srithamaraj	730	10	73
Lampang	472	9	52
Nakorn Rajasima	1,095	9	121
Naradhiwat	266	9	29
Surajdhani	325	8	41
Chiengrai	812	7	116
Chumporn	175	7	25
Chanaburi	158	6	26
Ubol Rajadhani	1,131	6	188
Udorndhani	744	6	124
Kanchaaburi	233	6	39
Puket	76	6	13
Pichit	389	5	78
Sukothai	316	5	63
Pattani	282	5	56
Ayudhaya	479	4	120
Lopburi	335	4	84
Saraburi	304	4	76
Samud Prakarn	235	4	59
Prae	299	4	75
Pitsanulok	352	4	88
Nakorn Pathom	370	4	92
Petchaburi	238	4	59

CHANGWAD (PROVINCE) (1)	POPULATION (CENSUS 1960) PER 1000 (2)	NO. OF BANK OFFICES (3)	BANK OFFICE PER 1000 POPULATION (2) : (3)
Samud Songkram	162	4	41
Supanburi	491	4	123
Nondaburi	196	3	65
Chazerngsao	323	3	108
Rayong	148	3	49
Chayapoom	486	3	162
Nongkai	257	3	86
Lampoon	250	3	83
Uttaradit	260	3	87
Tak	168	3	56
Petchaboon	320	3	107
Prajuab Kirikhan	152	3	51
Pang-Nga	93	3	31
Ranong	38	3	13
Buriram	584	2	292
Surin	582	2	291
Nakorn Panom	436	2	218
Roi-et	668	2	334
Skol Nakorn	427	2	213
Nan	240	2	120
Uthaidhani	146	2	73
Samud Sakorn	166	2	83
Patalung	234	2	117
Chainat	245	1	245
Patoomthani	190	1	190
Singburi	154	1	154
Angtong	198	1	198
Trat	66	1	66
Nakorn Nayok	154	1	154
Prachinburi	335	1	335
Sri Saket	601	1	601
Kalasin	427	1	427
Mahasarakam	499	1	499
Loey	211	1	211
Kampaeng Petch	173	1	173
Krabee	94	1	94
Stul	70	1	70
Sub Total	26,178	474	
Mae Hong Sorn	81	-	
Total	26,259	474	

SOURCE: Based on information provided by the Bank of Thailand, cited in Rozenthal, *op. cit.*, p. 39.