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30th

ANNUAL REPORT

RESEARCH INSTITUTE FOR ECONOMICS
AND BUSINESS ADMINISTRATION
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CONTENTS

NATIONAL MONETARY POLICY IN AN
INTERNATIONAL CAPITAL MARKET*

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Introduction

In the interwar period, under the influence of international economic disintegration and marxist theories of capitalism, there was a feeling that competition was progressively supplanted by monopoly. To protect competition, the United States thought it necessary to activate her antitrust policies, and after the war these spread to Europe.

Reality turned out to be different. Contrary to expectations, there was a general increase in competition, caused mainly by the progressive integration of international economic relations. The "new protectionism", which is talked about so much today, emerged as a reaction to this trend. Like "old protectionism", it had little to do with the general interest, but a lot with the political influence of the special interests concerned. Free trade manifestos by ministers of trade sound hollow when each claims a "special case" for precisely those sectors which are politically influential in his own country. European agricultural policies, including those of Switzerland, offer an impressive array of examples.

Naturally, this development is particularly obvious in commodity markets. However, it has a counterpart in money and capital markets. The following discussion is about the progressive integration or internationalization of capital markets and its implications for national monetary policies.

1. The Integration of Capital Markets

The first part is about the international integration of capital markets and the accompanying intensification of competition. The discussion will be limited to three aspects which are of special relevance for national monetary policy.

1.1. Growing Perfection of Asset Arbitrage

The first aspect concerns the growing perfection of international asset arbitrage. Whoever has a choice between an investment in D-Marks and an investment in

dollars will, other things equal, react to a decline in dollar interest rates by increasing the share of D-Marks in his portfolio. This portfolio shift will mainly be checked by two factors. One restraint may result from an increase in risk; this will not be further discussed here. The other restraint is transaction costs. Transaction costs originate from the time, trouble, telephone expenses, computer time, etc. which each transaction requires. For security transactions they are most easily recognized in brokers' fees, in exchange markets they are reflected in the margin between purchasing and selling rates, and in the money market they appear in the margin between borrowing and lending rates.

Just as transportation costs impede international price equalization for commodities, so do transaction costs on assets impede the equalization of yields, thus isolating one asset from another.

Where they are high, the yields for various securities, currencies or countries can differ widely even with the same risks; arbitrage is very imperfect. However, where the transaction costs are low the yields have to be virtually even; arbitrage is relatively perfect.

During the last decades, technical progress in financial services, due largely to the electronic revolution, has resulted in a fall in transaction costs and thereby in more perfect arbitrage. As a consequence, interest differences tend to lead to prompt and extensive portfolio shifts.

This is often described as an increase in the mobility of international capital flows. The conclusion seems to be that even small differences in interest rates now cause a country's capital accounts to oscillate rapidly between net inflows and net outflows. Highly perfect arbitrage thus becomes identified with a high sensitivity of net capital movements. Now every beginner in economics learns that capital imports are inevitably accompanied by an import surplus for goods and services. From this it is concluded that the relative perfection of asset arbitrage increases the danger of perpetual disturbances of trade flows.

This is a misunderstanding. As a matter of fact, asset arbitrage is quite different from net capital flows in a balance of payments sense. Arbitrage takes place between different securities—more generally: capital assets—regardless of the nationality of the investor. Net capital movements, on the other hand, take place between the residents of different countries, and the type of investment is of no consequence. With pure arbitrage, each participant and each country preserve their net wealth, whereas the essence of capital movements lies precisely in a shift of net wealth between participating countries. Consequently, the progressive perfection of arbitrage, taken in itself, has no particular relationship with the volatility of aggregate capital and trade flows.

The real problems of international asset arbitrage are at a different level. One

of the most important concomitants of exchange rate flexibility is the so-called
"overshooting" of exchange rates, which means that the rate of exchange first reacts
to shifts of monetary policy with apparently excessive oscillations. The essential
point is that the "nervous" reaction of exchange rates is not necessarily the result
of "irrational" or "pathalogical" speculation, but may be the result of rational
behavior under approximately perfect arbitrage.

This leads to one of the basic problems for present-day monetary policy. In the
long term the purchasing-power parity proposition is valid. It essentially says that
monetary policy has the same influence on exchange rates as on commodity prices,
so that the real exchange rate is nothing to worry about. In the short term, however,
from month to month, monetary policy has a much stronger influence on the exchange
rate than on commodity prices, thereby producing disturbances of the real exchange
rate. Gustav Cassel recognized 60 years ago that these disturbances can be very
serious. Experience since the collapse of Bretton Woods confirms this view. In some
cases the primary effect of these disturbances is on foreign trade. However, this is
not necessarily so. In fact, it is quite possible for these disturbances to show
themselves primarily in domestic production and employment; at the same time there
may be talk about an "export miracle" in foreign trade. In view of the risk of serious
employment disturbances, the arbitrage-induced overshooting of exchange rates
poses the first problem for national monetary policy. It is one of the strongest forces
behind the "new protectionism".

1.2. Mobility of the Money Markets

A second aspect of the integration of capital markets concerns the international
mobility of money markets.

The classical theory of international trade shows how the location of industry
is determined by comparative costs. For commodities, comparative costs depend
primarily on a country's natural resources and factor endowments. One of their
characteristics is their low mobility. As a consequence, a country's principal export
and import goods often remain the same for decades or even centuries.

In the field of finance, location tends to be less firmly rooted. Nevertheless,
financial centers often maintained their importance for a long time. The notion that
the money market in dollars is naturally located in New York or at any rate in the
United States, while Swiss francs have their market in Zürich, Basel or Geneva,
survived into the postwar period. One of the most important financial developments
of the last 25 years has been the progressive weakening of these locational ties,
accompanied by an increasing mobility of money markets.

The signal was given by the partial migration of the dollar market to London
and the emergence of the Euro-dollar market. The United States thus paid the price
for the minimum reserve requirements and interest ceilings which she chose to impose

on her banks. In the meantime, the dollar market has spread all over the world and the same has happened with other currencies, although to a lesser extent.

This development was decisively encouraged by the rapid improvement and cheapening of the international transmission of information. An additional impulse comes today from the multinationalisation of individual banks. If a bank maintains a worldwide network of offices, with virtually instant transmission of information, minute differences in profit margins may be enough to cause a movement of certain banking activities from London to one of the Caribbean islands and from there perhaps to Luxembourg. Within a few years, and indeed almost within months, new financial centers can emerge while others decline. Apparently trivial tax differences can cause a market for gold or Eurobonds to move from one country to another.

Under these conditions, the main determinant for the international location of financial services is legislation, especially banking legislation, fiscal laws and foreign exchange legislation. Whereas natural comparative advantages are the primary determinants of location in the fields of production and industry, the primary factors in financial markets are comparative advantages of a political kind. As will be shown, this has far-reaching consequences for monetary and banking policies, and here, too, protectionism raises its head.

1.3. Competition for International Loans to Governments

The third aspect of capital market integration is the international banking competition for loans to foreign governments. One of the striking changes in the international asset structure is the relative decline in direct investments and the relative increase in bank credits as a proportion of capital exports by highly developed countries. Most conspicuous is the increase in bank credits to foreign governments.

This raises the problem of how credit risks should be evaluated in such cases. Naturally, banks have done extensive work on this problem; piles of papers have been written about so-called "country risks". The first reaction is to construct coefficients and ratios similar to those which have proved useful for private debtors, like the interest/export ratio or the proportion of foreign debt to exchange reserves. The debt crisis of recent months has revealed these criteria to be deficient. It is now clear that the banks, under the pressure of intensive competition for foreign loans, have widely misjudged their risks.

I am inclined to believe that there is, above all, *one* fundamental difference between a private domestic credit and most of these foreign government loans, whose significance the banks did not fully understand. I mean the fact that for these government loans there is neither collateral nor a bankruptcy court. If a mortgage debtor cannot keep up with his payments, he loses his house. When a firm becomes insolvent, the court transfers its assets to the creditors. In the case of foreign government debtors, this pressure is usually lacking. Under these circumstances the debtor

has only *one* strictly economic motive for fulfilling his obligations, namely the fear of receiving no further credits in future. So long as the debtor can hope to meet his obligations from new loans and still have something left over, the obligations will naturally be met. However, if debt grows too rapidly, sooner or later there is inevitably a critical point at which interest and amortization payments begin to exceed new borrowings. Cash payments should now reverse their direction, beginning to flow from the debtor to the creditor. At this point, from the point of view of pure self-interest, it becomes clearly advantageous for the debtor to default.

Naturally, insolvency will rarely be explained in these terms. As a rule, the debtor will have a thousand excuses for what he calls his "absolute inability to pay", pleading unfavorable and unforeseeable circumstances like bad harvests, falling export prices, rising import prices, recession, etc. However, one should not be overly impressed by such pleadings, for every finance minister worth his salt can produce a "financial crisis" within three months, the easiest way being the overvaluation of the currency.

Under these conditions, the only protection for creditors is to expand their loans so slowly that the critical point is never reached. This calls for lending to be carefully adjusted to the long-term economic growth of the debtor, which again requires complete information about all loans and close co-operation among creditors. Evidently, free competition does not automatically solve this problem—this is precisely why collateral and bankruptcy courts were created in national credit markets.

In particular, there is a classic congestion problem. In road transportation, congestion problems arise because each driver, when selecting a route, takes into account only his own loss of time, omitting the time losses he imposes on other people. For loans, an analogous externality problem can arise, inasmuch as each bank is only concerned with its own risk, leaving out of consideration the additional risk its own loans impose on the claims of creditors. As a consequence, the volume of such loans tends to become excessive.

On the whole, bank loans to foreign governments, under the pressure of competition, have often exceeded the critical point. This raises a third problem for the monetary policy of creditor countries.

2. Implications for National Monetary Policies

The first part of this article described three aspects of international capital market integration. The second part will draw some implications for national monetary policies.

2.1. The Efficacy of Monetary Policies

The first implication concerns the efficacy of monetary policy. It is often argued that the internationalization of the money market reduces the effectiveness of national monetary policy. Will not monetary contraction lose its anti-inflationary effect if any borrower can provide for all his needs by simply going into the Euromarket? Will an easing of credit conditions not lose its stimulating power if the additional money is just used to repay Eurocredits? From such questions it is only a short step to the conclusion that either the internal market must be insulated from the external market or the external market must somehow be brought under control too. The internationalization of monetary markets thus leads to national protection.

For a proper evaluation of this argument, it is convenient to distinguish between two types of monetary policy. One type consists of measures in which the central bank acts like other market participants, for example, by buying or selling domestic securities or foreign exchange. Such measures may be called "market instruments". The other group of "nonmarket instruments" consists of regulatory measures by which the central bank imposes restrictions on banks or individuals. Minimum reserves and interest ceilings may serve as examples.

The effectiveness of nonmarket instruments is indeed undermined by the internationalization of money markets. In fact, interest ceilings have largely disappeared, and the importance of minimum reserve requirements as an instrument of monetary policy is declining. This is hardly to be regretted. Economists, including both Keynesians and monetarists, always tended to be critical of interest ceilings, and, in retrospect, it seems hard to justify that in the early post-war period minimum reserves were elevated to the rank of a "classical" instrument of monetary policy.

At the same time, market instruments lost nothing of their efficacy through the internationalization of money markets. If the Federal Reserve System buys treasury bills on the open market, the market for dollar funds becomes more liquid, regardless of whether it is located in New York or London. Consequently, the internationalization of the money market does not weaken the responsibility of each central bank for the national money supply and the national price level. With flexible exchange rates, each central bank is master of the long-term development of the national price level, irrespective of the existence of Euromarkets.

2.2. Exchange Rate Overshooting

This does not mean that the internationalization of capital markets causes no problems to monetary policy at all. There are indeed such problems, particularly with respect to the overshooting of exchange rates.

It was sometimes proposed to reduce overshooting by artificial restraints on arbitrage, similar to the American interest equalization tax of the 1960s. It is true that some of these proposals came from bureaucrats with little economic under-

standing, but some were made by respected economists. In my view, this protectionist
approach is mistaken. In principle, the growing perfection of asset arbitrage improves
the efficiency of the economy in the same way as the lowering of transportation costs
by the advent of railroads. To neutralize this efficiency gain through taxes would be
as counterproductive as the replacment of transportation costs by import tariffs.
Furthermore, in order to withstand the relentless pressure of profitable arbitrage,
the system of fiscal impediments would have to be so pervasive that in the end it
would become virtually equivalent to an adjustment in interest rates.

As an escape from overshooting exchange rates, others have recommended a
return to fixed exchange rates, and their number has recently been growing. It can
be shown that in an inflation-free world fixed exchange rates would indeed be the
best currency arrangement. In such a world, the Bretton Woods system would not
have collapsed in the first place and its junior successor, the European Monetary
System, would not just survive, but prosper. However, in an inflationary world a
system of fixed exchange rates can, at best, only drag itself from crisis to crisis. For
this reason, any attempt to create a new institutional framework for fixed exchange
rates would, so far, have been doomed to fail. However, once the United States can
look back on five inflation-free years with satisfactory employment, the return to
fixed exchange rates will probably be almost automatic. Fixed exchange rates are
not a question of international conferences but of national monetary policies.

It seems to me that, at the present time, the overshooting of exchange rates has
two main implications for monetary policy. First, it makes a steady course of
monetary policy even more important. Sudden changes in the direction of monetary
policy are the main cause of overshooting and the avoidance of such changes must
be regarded as the principal guideline for monetary policy, both with regard to the
domestic economy and from the point of view of international co-operation.

Second, national monetary policy must remain flexible enough to dampen
massive deviations of exchange rates from purchasing power parity, if necessary
through temporary deviations from long-term monetary targets. Success in this
effort would make a notable, and perhaps decisive, contribution towards averting the
"new protectionism". Precisely the maintenance of a steady long-term course may
thus, under certain conditions, call for considerable short-term flexibility in the
conduct of monetary policy. Fortunately, during recent years, central banks seem
to have made significant progress in combining steadiness with flexibility.

2.3. Competitive Deregulation

A third implication of capital market integration concerns banking regulation. In
the early post-war years, banks found themselves subjected to highly restrictive
legislation which narrowed the range of their business activities, required excessive
and discriminatory reserves and limited competition in interest rates. In view of the

high and ever-increasing mobility of capital markets, such discriminatory measures result in an increasing tendency for the affected firms to move abroad. In such cases, the authorities, like monopolists faced with outsiders, have a choice between two strategies.

One strategy is to persuade other governments to impose similar restrictions and, if necessary, to enter into an international agreement. International co-operation of this type leads, in the end, to a regulators' cartel. In this spirit, the Federal Reserve System, confronted with the movement of banking firms to the Euromarket, tried to persuade European central banks of the necessity of a co-ordinated regulation of the Euromarket. Such endeavors are not particularly promising, because the more insiders are regulated the more lucrative becomes the position of outsiders, and the latter will be in no hurry to kill the goose that lays the golden eggs.

The alternative strategy consists in relaxing the discriminatory restrictions. This is the strategy the United States has actually followed in recent years with her radical revision of banking legislation. The partial return of the dollar market to the United States after the establishment of the International Banking Facilities highlights the effect of such a policy.

Altogether, international competition for profitable financial markets might lead to a gradual liberation of banking firms from the shackles of discriminatory regulation. Financial people do not necessarily vote with their ballot or with their feet, but they do vote quite effectively with their check books. This can be generalized. Time and again throughout history, it has been international migration which limited the power of the state. Financial markets show that this is not just a question of the migration of people, but also of capital and markets.

2.4. Protection against Default Losses

The preceeding argument does not at all mean that regulatory measures in the financial sector are inefficient and obsolete in all cases. In fact, in some cases they appear to be not only necessary but in need of strengthening. In particular this seems to be true for those measures which do not, in the final analysis, put a discriminatory burden on the banks' customers but rather protect them against risks.

What I have in mind are the policy implications of default losses on loans to foreign governments. The starting point must be the observation that there is no reason for such losses to be shifted from the banks to the taxpayer through the intermediary of the International Monetary Fund. It is sometimes argued that the delinquent loans had been in the interest of the creditor countries, in as much as they helped to finance their exports and thereby to reduce unemployment. This argument —a mixture of Keynesian reflections about the usefulness of unproductive pyramid building, post-Marxian theories of imperialism and robust mercantilism—is not valid, though. Imprudent foreign credits are not in the interest of the creditor country,

and its taxpayers are under no moral obligation to shoulder responsibility for them. There is no particular reason, therefore, to deplore the fact that the International Monetary Fund is now pushing against the limits of its lending capacity.

A second observation concerns the fact that relief should not be expected from a return to prosperity in the world economy nor from an American policy of cheaper money. Prosperity in the world economy would not necessarily help because it has little effect on the profitability of insolvency for many debtors. An American monetary expansion would indeed help the debtors, but only at the cost of a return to inflation. A negotiated reduction in foreign claims would still be preferable to the euthanasia of the creditor through inflation.

In the light of these observations, a defensible strategy might include the following points. First, the annual rate of debt expansion must be drastically reduced; otherwise the problem will become more insoluble with each postponement. In particular, the rate of increase of indebtendness must be reduced below the rate of economic growth, so that in the course of time the real pressure of the debt declines, gradually leading back to a steady state. Second, by co-operation between banks, central banks and international institutions, it should be made possible to maintain an annual credit flow slightly higher than annual payments on interest and principal. Third, the externality problem could be reduced, if not eliminated, by requiring banks to publish full information about their loans to foreign governments. Fourth, shareholders of incautious banks must be expected to bear losses. Fifth, in view of the absence of collateral and bankruptcy courts, we can hardly dispense with diplomacy and general foreign policy to reinforce the payment morale of debtor countries. Such a strategy of debt reduction "on a slow burner" actually seems to emerge. Whether it will be successful is quite uncertain, but at least it does not appear hopeless either.

Conclusion

It is customary today to refer to the condition of the international monetary system as being "in crisis". I do not share this pessimism. It is true that structures like the European monetary system may collapse, though even these have shown themselves to be more stable than pessimists have feared. In the main, however, whatever there is to collapse has already collapsed eleven years ago. The present state of affairs is a rubble-heap, and such heaps tend to be very stable. Certainly banks may get into difficulties, but in cases of occasional disturbances in the international capital market the national monetary policy of the individual countries should, I believe, be able to preserve its effectiveness, thereby also making an essential contribution to the defense against the "new protectionism".

It also seems to me that the outlook is more hopeful today than it has ever been in the last ten years. Assuming sensible national policies, countries with highly developed financial markets can hope, in the foreseeable future, to overcome long-term inflation and to find their way back to normal economic growth. In spite of all controversy, and in part even because of it, policy-makers have learnt much in the past twenty years, as shown by the examples of the United States, Japan, England, Germany and Switzerland. To be sure, it is not difficult to lapse back into the errors of the sixties. But neither should it be very difficult to make the coming years a period of solid progress.

CRAFT UNIONS, WAGES AND EMPLOYMENT*

Murray C. KEMP**

1. Introduction

The relationship of the level of unemployment to the policies of labour unions still is the subject of lively debate. Similarly, the impact on wages and employment of capital accumulation, technical improvements and the level of the dole remains the subject of wide differences of opinion, especially between academic and other economists. In the present paper I seek to model powerful labour unions which set the wage levels to which competitive employers must then adjust. Thus the analysis focuses on the interaction of employment and labour supply. Indeed, to make the focus as sharp as possible I proceed on the assumption that the aggregate demand for goods always matches the aggregate supply.

One expects that unions will press for real wages incompatible with the full employment of all types of labour. However in practice large unions must recognize that, even if their members are not called upon to directly support the unemployed, they must do so via the income tax, and this understanding serves to moderate their demands; moreover unions may provide direct support for their unemployed members. Of course the working members of any given union share with the working members of all other unions, and with non-union income earners, the burden of supporting the unemployed. There is here an obvious externality, and the more numerous the unions and the smaller the proportion of national income accruing to labour the more severe the externality. Nevertheless it is possible that union pressure on real wages is sufficiently curbed by the prospect of higher taxes that there exists a definite and non-trivial equilibrium of Nash type. Indeed it is possible that the equilibrium involves the full employment of some or all types of labour.

My first purpose is to examine this possibility in detail. After establishing the existence and uniqueness of a non-trivial equilibrium I provide a condition for it

to be of the full-employment type. I then proceed to examine the responses of the equilibrium to changes in some of the parameters, notably the level at which the unemployed are supported, the state of the industrial arts, the size of the work force and the stock of accumulated capital.

The detailed analysis and statement of conclusions may be found in Section 2. The third and final section contains some brief remarks concerning the scope of the conclusions.

2. Analysis

There are n types of labour, each with its own craft union; and there are unspecified additional factors like capital and land. All labour is unionized. There is an aggregate production function which for simplicity and to ensure comparability with a companion analysis of seniority (Kemp et al. [1]), we take to be of the symmetrical Cobb-Douglas type

$$(1) \qquad Q = \mu L_1^{\alpha/n} \ldots L_n^{\alpha/n} K^{1-\alpha} = \mu \left(\prod_{i=1}^{n} L_i^{\alpha/n} \right) K^{1-\alpha} \qquad 0 < \alpha < 1$$

where L_i is the level of employment of the ith type of labour, the constant K (for "capital") is a catch-all for factors of production other than labour, and μ is a positive parameter variations in which indicate changes in the state of the arts. Initially, $\mu = 1$.

Employed labour of the kth type receives a gross or pre-tax wage w_k, unemployed labour of any type receives the dole $\bar{w}$, and the owners of capital receive a rental r. All factor returns are in terms of product.

Given (1), the unit-cost function is

$$(2) \qquad c = \mu^{-1} (\alpha/n)^{-\alpha} (1-\alpha)^{-(1-\alpha)} r^{1-\alpha} w_1^{\alpha/n} \ldots w_n^{\alpha/n}$$

Under competitive conditions, unit cost=price=1; hence we obtain from (2) the equation to the (real) factor-rental frontier:

$$(3) \qquad 1 = \mu^{-1} (\alpha/n)^{-\alpha} (1-\alpha)^{-(1-\alpha)} r^{1-\alpha} w_1^{\alpha/n} \ldots w_n^{\alpha/n}$$

Let a_k be the demand for labour of the kth type, per unit of output; and let b be the demand for capital, per unit of output. From duality theory,

$$\partial c / \partial w_k = a_k$$
$$\partial c / \partial r = b$$

and, from (2) and (3),

$$\partial c / \partial w_k = (\alpha/n)(c/w_k) = (\alpha/n)(1/w_k)$$
$$\partial c / \partial r = (1-\alpha)(c/r) = (1-\alpha)(1/r)$$

Hence

$$(4) \qquad \begin{aligned} a_k &= (\alpha/n)(1/w_k) \\ b &= (1-\alpha)/r \end{aligned}$$

It is assumed that each union seeks to maximize the total real income of its members and that, by means of intra-union welfare payments financed by union dues, it distributes that income evenly over its members. Now the real income Y_k of the kth union is the sum of the net or after-tax earned income of its employed members and of the dole payments received by its unemployed members. The former is $L_k w_k$ $(1-t)$, where t is the uniform rate of tax on earned income; the latter is $(N_k-L_k)\bar{w}$, where N_k is the membership of the kth union. Hence

(5) $\qquad Y_k = L_k w_k(1-t)+(N_k-L_k)\bar{w}$

The supply of labour of the kth type is

$$N_k = \begin{cases} N/n \text{ if } Y_k > (N/n)\bar{w} \\ 0 \text{ if } Y_k \leq (N/n)\bar{w} \end{cases}$$

where N is a positive constant. Hence the total supply of labour is N if $Y_k > (N/n)\bar{w}$ for all k, and is zero if $Y_k \leq (N/n)\bar{w}$ for all k. On the other hand, from the symmetry of the model, in any equilibrium $Y_k = Y$ for all k. Hence in any non-trivial equilibrium $Y_k > (N/n)\bar{w}$ for all k. The level of employment is then $N-\Sigma L_i$ and dole payments sum to $(N-\Sigma L_i)\bar{w}$. Assuming that the only functions of government are to raise taxes and make dole payments, the rate of tax must be[1]

$$t = (N-\Sigma L_i)\bar{w}/Q$$
$$= [(N/Q)-\Sigma a_i]\bar{w}$$
$$= [(bN/K)-\Sigma a_i]\bar{w}$$

(6) $\qquad \equiv \bar{w}(N/K)\,((1-\alpha)/\gamma)\,[\Pi w_i^{\alpha/n}]^{1/(1-\alpha)} - \bar{w}(\alpha/n)\Sigma(1/w_i)$

where

$$\gamma \equiv [\mu(\alpha/n)^{\alpha}(1-\alpha)^{1-\alpha}]^{1/(1-\alpha)}$$

In a Nash equilibrium it is impossible for any kth union to enhance its real income by adjusting the gross real wage w_k, given the remaining $n-1$ gross real wages. Now the rate of change of Y_k with respect to w_k is, from (5),

(7) $\qquad \dfrac{\partial Y_k}{\partial w_k} = [w(1-t)-\bar{w}]\dfrac{\partial L_k}{\partial w_k} + L_k\left[1-t-w_k\dfrac{\partial t}{\partial w_k}\right]$

But, from (3) and (4),

$$L_k = a_k Q$$
$$= a_k K/b$$

(8) $\qquad = \dfrac{\alpha}{n}\,\dfrac{\gamma K}{1-\alpha}\,w_k^{-1}(\Pi\ w_i^{-\alpha/n})^{1/(1-\alpha)}$

whence

$$\dfrac{\partial L_k}{\partial w_k} = -\dfrac{\alpha+n(1-\alpha)}{n(1-\alpha)}\,w_k^{-1}L_k$$

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[1] Neither the dole nor intra-union unemployment benefits are taxed. This is an innocuous assumption since, as we have noted, in any non-trivial equilibrium, take-home pay $Y_k/(N/n)$ exceeds the dole.

(9) $$= -\frac{\alpha+n(1-\alpha)}{n(1-\alpha)}\,\frac{\alpha}{n}\,\frac{\gamma K}{1-\alpha}w^{-(2-\alpha)/(1-\alpha)}$$

in symmetric equilibrium; and, from (5) and (6),

(10) $$1-t-w_k\frac{\partial t}{\partial w_k}=1-\bar{w}\frac{N}{\gamma K}w^{\alpha/(1-\alpha)}\Big(1-\alpha+\frac{\alpha}{n}\Big)+\alpha\bar{w}w^{-1}\Big(\frac{n-1}{n}\Big)$$

in equilibrium. Hence, substituting from (8)–(10) into (7),

(11) $$\frac{\partial Y_k}{\partial w_k}=\frac{\alpha}{n}\,\frac{\gamma K}{1-\alpha}w^{-1/(1-\alpha)}\Big[\bar{w}w^{-1}-\frac{\alpha}{n(1-\alpha)}\Big]$$

which, in any equilibrium, must be non-positive.

For the existence of a non-trivial equilibrium it suffices that at full employment the marginal product of each type of labour exceeds the dole, that is,

$$\bar{w}<\frac{\partial Q}{\partial L_k}\Big|_{L_1=\,..\,=L_n=L=N/n}$$

$$=\frac{\alpha}{n}\,\frac{Q}{L}$$

$$=\mu\frac{\alpha}{n}\Big(\frac{N}{nK}\Big)^{-(1-\alpha)}$$

(12) $$\equiv w^*$$

It will be assumed that this condition is satisfied.

Evaluating (11) at full employment, with $w=w^*$, we find that

$$\frac{\partial Y_k}{\partial w_k}\Big|_{w_1=\,..\,=w_n=w^*}$$

is non-positive if and only if

(13) $$\bar{w}\leqq\frac{\alpha}{n(1-\alpha)}w^*$$

Given (12), there is full-employment equilibr um if and only if (13) also is satisfied; and there is an interior equilibrium with unemployment if and only if (13) s violated, that is, if and only if

(14) $\alpha/n<1-\alpha$

so that the share in earned income of all non-labour factors combined exceeds the share of each type of labour.

Thus even a union-ridden equilibrium may be blessed with full employment. Nevertheless we proceed on the assumption that (14) is satisfied, so that unemployment is inevitable. The equilibrium wage is defined then by the first-order condition

(15) $$w=\frac{1-\alpha}{\alpha/n}\bar{w}>\bar{w}$$

which is obtained by equating (12) to zero;[2] and the associated level of employment is given by (8), with $w_i=w$ for all i. Eq. (15) is quite remarkable; it tells us that if $\bar{w}$

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2) The second-order condition is automatically satisfied if the first-order condition is satisfied.

is compatible with under-employment equilibrium (that is, if $\bar{w} > \dfrac{\alpha/n}{1-\alpha} w^*$) then the gross wage rate bears a relationship of constant proportionality to the dole; moreover the constant of proportionality is the ratio of non-labour earned income to the earned income of the typical union and thus is independent of all parameters of interest.

Equipped with (8) and (15) we can examine the responses of the equilibrium level of employment and the equilibrium wage rate to small changes in the parameters μ, K, N and $\bar{w}$. From (15),

(16a) $\qquad \dfrac{dw}{d\mu} = \dfrac{dw}{dN} = 0$

(16b) $\qquad \dfrac{dw}{d\bar{w}} = \dfrac{n(1-\alpha)}{\alpha} = \dfrac{w}{\bar{w}} > 0$

and, from (8) with $w_i = w$,

$$\dfrac{dL}{d\mu} = \dfrac{L}{\gamma} \dfrac{\partial \gamma}{\partial \mu} - \dfrac{1}{1-\alpha} \dfrac{L}{w} \dfrac{dw}{d\mu}$$

(17a) $\qquad = \dfrac{L}{\gamma} \dfrac{\partial \gamma}{\partial \mu} > 0$

(17b) $\qquad \dfrac{dL}{dN} = - \dfrac{1}{1-\alpha} \dfrac{L}{w} \dfrac{dw}{dN} = 0$

(17c) $\qquad \dfrac{dL}{d\bar{w}} = - \dfrac{1}{1-\alpha} \dfrac{L}{w} \dfrac{dw}{d\bar{w}} < 0$

In view of the Cobb-Douglas form of the production function, a burst of capital accumulation has exactly the same implications for wages and employment as does a technical improvement. Thus without detailed analysis we can be sure that the accumulation of capital raises the level of employment while leaving wages unchanged.

Moreover, from the factor-rental frontier (3),

$$r^{1-\alpha} = \mu(\alpha/n)^\alpha (1-\alpha)^{1-\alpha} w^{-\alpha}$$

in equilibrium. Hence

$$\dfrac{dr}{d\mu} = \dfrac{r}{\mu(1-\alpha)} - \dfrac{\alpha}{1-\alpha} \dfrac{r}{w} \dfrac{dw}{d\mu}$$

(18a) $\qquad = \dfrac{r}{\mu(1-\alpha)} > 0$

(18b) $\qquad \dfrac{dr}{dN} = - \dfrac{\alpha}{1-\alpha} = - \dfrac{\alpha}{1-\alpha} \dfrac{r}{w} \dfrac{dw}{dN} = 0$

(18c) $\qquad \dfrac{dr}{d\bar{w}} = - \alpha \dfrac{r}{w} \dfrac{dw}{d\bar{w}} < 0$

3. Final Remarks

The short-run comparative-statical conclusions summarized in (16) and (17) contain

no real surprises[3]. Accordingly, we do not pause to decorate them with elaborate commentary. Perhaps the chief virtue of the foregoing analysis is its demonstration that familiar results have a much broader field of application than their origins in single-union models would suggest[4].

In conclusion I venture two suggestions for further work. First, it is recalled that the analysis of Section 2 is short-run in the sense of taking the stock of capital as a datum. However, given time, the stock of capital can be expected to adjust to changes in the other parameters, and this suggests that the direction of the adjustment of employment and wages to changes in those parameters may depend on the time allowed for adjustment. Comparative steady-state calculations could be made to check this conjecture. Second, it has been assumed throughout Section 2 that the economy is closed to foreign trade. It is not difficult to adapt the analysis and conclusions to fit a *small* open economy, facing invariant world prices. However a complete analysis of the large-country variable-terms-of-trade case requires a careful reformulation of each union's objectives and of the concept of a dole. Such an analysis might not be easy; but it would be well worth attempting.

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[2] Oswald, A.J., "Trade Unions, Wages and Unemployment: What Can Simple Models Tell Us?" *Oxford Economic Papers* 34, 1982.

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3) The finding that wages are independent of the state of the arts is a partial exception; but that particular result is a theoretical artefact created by the unitary elasticity of substitution of the Cobb-Douglas production function.

4) For an excellent example of one-union analysis, the reader is referred to Oswald [2].

ON THE APPLICABILITY AND IMPLEMENTABILITY
OF THE (FINITE) COMPENSATION PRINCIPLE*

Murray C. KEMP**

1. Introduction: the Compensation Principle

The so-called Compensation Principle has become one of the corner stones of modern or post-Pigovian welfare economics. According to that Principle, any change in economic policy is to be judged advantageous if those individuals who suffer as the result of the change can be and in fact are compensated by those who benefit from the change and if, after compensation has been effected, all individuals are better off than before the change.

Until recently it has been taken for granted that in *implementing* the Compensation Principle goods and/or money are to be taken from those who have benefitted from a change in policy and given to those who have suffered. What could be more natural?

During the past decade or so, however, there has been a growing awareness among economists (in particular, among those who specialize in the theory of international trade or in the theory of public finance) that the implementation of the Principle is not always completely straight-forward. Thus there have been unearthed cases (indeed, whole classes of cases) in which the direct welfare effects of a transfer between agents are dominated and reversed by the price-induced or indirect effects, implying that the implementation of the Principle may require the transfer of goods and/or money from the losers to the gainers. Moreover, but on another tack, it has *been suggested that changes in government policy nearly always involve loss of life* for which no finite amount is adequate compensation. Let us dwell for a moment on the first of these two possibilities.

The earliest and most important discoveries were made by Michihiro Ohyama [5, 6] and David Gale [2]. At the time when Ohyama and Gale were writing, the sum total of our knowledge concerning the welfare effects of transfers was contained in

the famous Mill-Samuelson proposition from the pure theory of international trade: Under the assumptions of the standard Heckscher-Ohlin model of trade, a small transfer necessarily improverishes the donor and enriches the recipient. However the standard model of trade is rather special—in particular, it allows no market distortions and it recognized only two countries and two produced commodities, both of them specialized private consumption goods; and it was the contribution of Ohyama and Gale to show that, when those assumptions are relaxed, the conclusion of the Mill-Samuelson proposition cannot be established. Thus as early as 1972 Ohyama [5, Proposition 19] demonstrated the possibility that, in the context of stable tariff-ridden trade between two countries, a small transfer in kind may impoverish the recipient; and, shortly after (Ohyama [6]), he returned to the subject in greater detail. Moreover he showed (in Ohyama [6]) that the recipient might be harmed by aid which is tied (by the donor or otherwise)[1]. Thus Ohyama showed that the Mill-Samuelson proposition fails if market distortions (broadly interpreted) are allowed. Gale, on the other hand, showed that if distortions are ruled out but if three or more countries are allowed then the Mill-Samuelson proposition again breaks down: the recipient may be impoverished by a transfer and/or the donor enriched.

In Section 2 of the present paper I add marginally to the pathology of compensation by considering a class of examples which incorporate public consumption-goods (and which therefore are quite different from those of Ohyama and Gale). In the examples now considered, sufficiently small finite transfers have no bearing whatever on the welfare of either donor or recipient; that is, transfers are locally impotent in effecting compensation[2].

To this point we have focussed on possible ambiguities in the *implementation* of the Compensation Principle. The Principle itself remained unchallenged. However the possibility of policy-induced death has been made by John Broome [1] the basis of a serious attack on the Principle itself. Broome's argument will be considered, and ultimately rejected, in Section 3.

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1) Ohyama did not answer (or indeed ask) some questions now thought to be of interest: for example, is it possible for a transfer to simultaneously impoverish the recipient and enrich the donor? But he provided the raw materials from which answers to such questions can be easily derived.

2) Even in the models of Ohyama and Gale it is possible that the indirect or price-induced effects of a transfer may exactly cancel each other. However in their models such an outcome requires a singular constellation of parameter values, a different constellation for each vector of transfers.

2. Conditions for the Local Impotence of Lumpsum
Transfers to Effect a Redistribution of Welfare[3]

Suppose that N countries collectively produce and trade m private consumption goods and t pure public consumption goods. Here it is understood that $N \geqq 2$, $m \geqq 0$, $t \geqq 1$ and $m+t \geqq 2$; thus it is not required that either countries or commodities exceed the traditional two in number. Suppose further that the governments of the trading countries have only two functions; they impose corrective taxes to ensure that, from the national point of view, private consumption of public goods is optimal; and they may engage in international lumpsum transfers. On the basis of these assumptions we can establish the following proposition.

PROPOSITION: If in international equilibrium each country purchases as least one public good then any pattern of sufficiently small international transfers leaves unchanged (a) world prices of both private and public goods, (b) the consumption by each country of both private and public goods, and therefore (c) the welfare of each country.

That is, within limits the world equilibrium is independent of the international distribution of income; a small international transfer is completely absorbed in offsetting changes in the private consumption of public goods in those countries which are parties to the transfer.

On reflection the proposition makes a strong appeal to common sense. Thus suppose that an initial equilibrium is disturbed by the transfer of one dollar from country 1 to country 2. If the donor cuts its expenditure on public goods by exactly the amount transferred and if the recipient increases its expenditure on public goods by the same amount then, in each country, the total consumption of each good, public and private, is unchanged and no country has an incentive to make further adjustments to its expenditure.

Warr [7] proved a version of the proposition suited to a closed economy with $t=1$; but he claimed that the proposition is invalid for $t>1$, thus implying that it is a mere curiosum. Kemp and Kojima [4], on the other hand, examined the welfare economics of international transfers under the polar specification that public goods are provided only by governments and are public only within the borders of a single country.

Proof of the proposition. Let c^i be the vector of consumption of private goods in country i; and let g^i be the vector of purchases of public goods in country i, so that Σg^j is the vector of consumption of public goods in each country. Let p be the vector

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of world prices of private goods, q the vector of world prices of public goods, and y^i the income of country i. The task of (the typical individual in) country i is then to find

(P) $\max\limits_{c_i{}^i g^i} u^i(c^i, \Sigma g^j)$

s.t. $pc^i + qg^i \leqq y^i$ (1)

$c^i \geqq 0,\ g^i \geqq 0$ (2)

where u^i is taken to be an increasing and strictly quasi-concave function. By assumption, any solution to (P) is interior in g^i; for simplicity only, suppose that it is interior in c^i also. The first-order conditions consist of (1) and

$u_k{}^i = \lambda^i p_k$ $k = 1, \dots, m$

$u_l{}^i = \lambda^i q_l$ $l = 1, \dots, t$

whence

$J_k{}^i(c^i, \Sigma g^j) \equiv u_k{}^i / u_t{}^i = p_k / q_t$ $k = 1, \dots, m$ (3a)

$J_l{}^i(c^i, \Sigma g^j) \equiv u_l{}^i / u_t{}^i = q_l / q_t$ $l = 1, \dots, t-1$ (3b)

Recalling that $i = 1, \dots, N$, we see that in (1) and (3) there are $n + n(m + t - 1) = n(m + t)$ equations in the same number of unknowns (nm $c_k{}^i$'s and nt $g_l{}^i$'s). If $t = 1$ we can reasonably require (1) and (3) to be uniquely soluble. When $t > 1$ we cannot expect to solve for the $g_l{}^i$'s, for to individual countries the source of supply of a particular public good is a matter of indifference; however, even when $t > 1$, we can reasonably require both the aggregate world supply of individual public goods and the value of all public goods supplied by each particular country to be uniquely determined, and that is all we need. Let the unique solution be indicated by asterisks. From (3a),

$c^{i*} = H^i(p, q, \Sigma g^{j*}) \equiv H^i(p, q, g^*)$ (4)

From (1),

$y \equiv \Sigma y^j = p \Sigma H^j(p, q, g^*) + qg^*$ (5)

From (5) and (3b), the latter with solution values inserted,

$g^* = D(p, q, y)$ (6)

Thus g^* depends on aggregate income only. From (4) and (6),

$c^{i*} = H^i(p, q, D(p, q, y)) \equiv E^i(p, q, y)$ (7)

hence

$c^* \equiv \Sigma c^{j*} = \Sigma E^j(p, q, y) \equiv E(p, q, y)$ (8)

Thus c^{i*} and therefore c^* depend on aggregate income only. The conclusions of the proposition follow immediately.

As already noted, the proposition does not rely on the assumption that country i purchases the whole range of private consumption goods; in fact it is not required that country i purchases *any* private consumption goods. Of much greater importance, it is not required that the intra-national publicness of public consumption goods be

offset by corrective taxes. That assumption merely simplifies the proof by allowing one to treat each country as a single coherent maximizer.

We note also that the proposition is valid for any international equilibrium, whether stable or unstable, whether or not some goods are inferior in consumption, and whether or not there are more than two countries. Thus it contrasts sharply with the recent literature on the welfare paradoxes of international transfers. (As we have recorded in Sec. 1, the key contributions are those of Ohyama [5, 6] and Gale [2]. For further references see Kemp and Kojima [4].)

What *is* indispensable is the assumed uniqueness of the world equilibrium. Without that assumption there are many ways of choosing the post-transfer equilibrium, and associated with each choice is a different vector of equilibrium national welfares.

3. The Valuation of Human Life

The argument advanced by John Broome [1] goes roughly as follows.

(a) As the result of almost any change in government policy lives are lost and lives are saved. Hence the application of the Compensation Principle requires that lives be valued.

(b) For the loss of life there is no adequate finite compensation.

(c) But all economies are finite.

(d) Hence the Compensation Principle is almost worthless as a device for ordering social alternatives.

In this syllogism step (b) is the weak link. We are all mortal; whatever choices the government makes, we will die. At worst, a change in policy merely advances the date of death; at best, it merely delays death. It therefore is reasonable to postulate that for each individual and for each advance of the date of death there exists adequate *finite* compensation, provided only that death is not immediate (there must be time to enjoy the compensation). (Figure 1 illustrates.) It then follows that no practicable change of policy can be ruled out on the ground that the required compensation is infinite. (Of course, policies to be implemented very soon may entail very large compensatory payments.)

Normally it will not be known whose death will be advanced by a proposed change of policy. But that does not invalidate our defense of the (Finite) Compensation Principle; it simply means that compensation must be paid to each individual for whom the distribution of probabilities of dying is made less attractive.

Nor is the Principle invalidated by the fact that normally a change in policy advances the date of death of individuals not yet born. Evidently the compensation of such individuals must await their birth. But that is neither here nor there; there

Figure 1
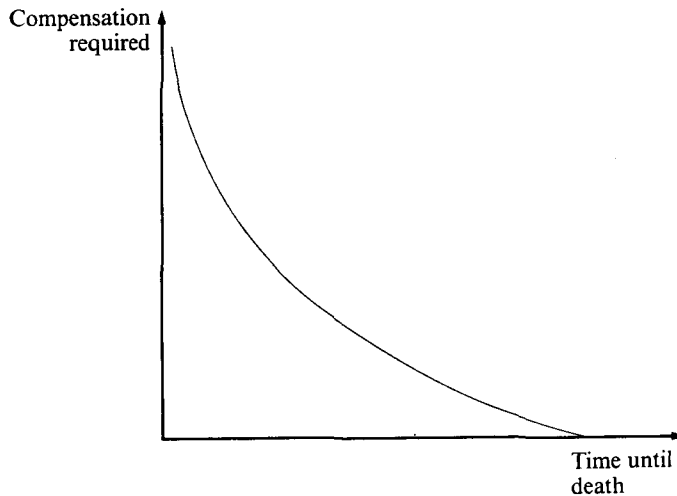
is nothing in the statement of the Principle to suggest that compensation must be paid when a policy is chosen, or at the moment of its implementation, or at any other specific time.

In summary, Broome's paper fails as a critique of the Compensation *Principle* but usefully draws attention to those difficulties of implementation associated with policydetermined mortality.

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INTERNATIONALIZATION OF JAPANESE COMMERCIAL BANKING

—THE RECENT EXPERIENCE OF CITY BANKS—

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1. Introductory Note

In recent years, Japanese position in the international economic-political society has risen rapidly. In addition, Japan is strongly requested to accomplish the international responsibility. It came up to the surface, as a practical problem, in the form of the much intenser financial friction between Japan and U.S.A. The difficult negotiation between both government authorities on this matter had been continued for a long time. After all, Finance Minister Takeshita and Treasury Secretary Regan agreed by the Yen-Dollar Committee (Report by the Working Group of Joint Japan-U.S. Ad Hoc Group on Yen/Dollar Exchange Rate, Financial and Capital Market Issues) was announced officially on May 29, 1984. The main problem imposed on Japan in the report on Yen/Dollar is to implement financial liberalization and yen internationalization. Firstly, financial liberalization implies both liberalization of Japanese financial institutions' business affairs beyond the fence on banks and financial intermediaries, and reciprocity of the Japanese financial institutions and the foreign banks in Japan. In particular, it mainly aims at liberalization of interest rates and internationalization of the financial institutions. Secondly, yen internationalization means that Japan-yen complements the function as the international currency of U.S. dollar, and bears the cost as an international currency, by the wide use of a bill of exchange denominated in yen at the time of export and import, and the need for yen as a reserve currency held by many Asian countries.

We have carried out twice the academic fact-finding type of research on internationalization of banks since our project started in 1977. Speaking of the situation of Japanese economy, the growth rate of real GNP has recovered to 4-5 % level since the latter half in 1983. Furthermore, current balance surplus in 1983 fiscal year is 24.3 billion dollar, trade balance surplus is 34 billion dollar, and overall balance surplus is 2.41 billion dollar. On the other hand, long-term capital balance is 34

billion dollar in deficit, and short-term capital balance is 1.3 billion dollar in deficit, i.e. net capital outflow takes place. Along with recovery of the economy, the ratio of saving to GNP in Japan is still the highest among the advanced nations. Private fixed investment is stagnant, because of increase of firms which can be self-financed, and advance of technological innovation. Because the opportunity for domestic investment decreases, excess-saving is naturally invested to U.S. and Euro-currency markets through banks and other financial institutions. Especially, Japanese capital balance in 1983 fiscal year recored 34 billion dollar, reflecting large scale foreign investment, on the basis of large surplus of current balance. Being indirect investment, portfolio-investment amounted to 16.7 billion dollar, about half of foreign investment. Such a high weight on portfolio-investment is characteristic of Japan as a country of capital outflow. Therefore, excessive competition of Japanese banks, particularly, thirteen city banks shifted to the oversea financial markets just as it is, and further, trust banks and life insurance companies and so on employ a mass of their funds abroad and make profits.

The average ratio of income from Japanese city banks' international business affairs to current profits was less than 10% when we started the project. At that time, the corresponding ratio of American banks was 40–50%, and the value of City Corp was 60–70%. However, the average ratio of Japanese banks from 1982 to 1983 reached 38%, exceeded 15–20%, the target range of all banks at the time of our first survey (Table 1, 2, 3, 4).

Moreover, considering the actual condition, the rapid improvement in Japanese banks' operating power in oversea financial markets, shown by the remarkable increase of the ratio of income from international sector to current profit represents an unprecedented share-up. If high interest rate in the U.S. persists, high saving rate in Japan do not fall suddenly, and domestic private fixed investment do not increase rapidly, we will expect the tendency mentioned above to continue for a while.

Besides, if financial liberalization and yen internationalization proceed steadily, the revenue of Japanese financial institutions will more depend on the foreign sides. As we pointed out earlier about the character of Japanese capital movement, portfolio-investment accounts for more than 50%. On the other hand, portfolio-investment to Japan by non-residents reached 12.5 billion dollar in 1983. Nowadays, 'money game' dominates international capital movements. We would like to dare to point out that this problem will be serious to the developments of the international finance in the future.

We have carried out the fact-finding type of research about internationalization of Japanese banks since it started in 1980. In 1983, we did the oversea academic investigation in Australia, New Zealand, Singapore, and Hong Kong. And we are completing the results at present. The following is the paper which our working

group members; Prof. Fujita, Prof. Mizushima, Prof. Mikitani, Associate Prof. Ishigaki and Associate Prof. Niwa, and then Prof. Suzuki (New South Wales University), who jointed us on the spot, made the interim report at the seminar, with

Table 1. The Thirteen City Banks, Closing the Books in March, 1983

(billion yen)

Bank	Ordinary Revenue (A)	Ordinary Income (B)	Income from International Affairs (C)	C/A %	C/B %
Dai-Ichi Kangyo	1,843	834	426	23.0	51.1
Fuji	1,778	1,365	620	35.0	45.4
Sumitomo	1,618	1,571	651	40.0	41.4
Mitsubishi	1,624	951	426	26.0	44.8
Sanwa	1,572	929	532	34.0	57.3
Mitsui	1,205	670	354	29.0	52.8
Tokai	1,087	558	336	31.0	60.2
Taiyo-Kobe	906	479	231	26.0	48.2
Daiwa	589	261	139	24.0	53.3
Kyowa	546	298	152	28.0	51.0
Saitama	513	305	96	19.0	31.5
Hokkaido Takushoku	417	241	114	27.0	47.3
Tokyo	1,493	504	1,224	82.0	242.9
average				3.30	63.6

Table 2. Net Profit from Related International Commercial Banking Business

(billion yen, %)

Bank	Total profit			Share of related international profit (%)			Details of 1983 fiscal year		
	1983 fiscal year	1982 fiscal year	amount of change	1983 fiscal year	1982 fiscal year	change	first half	second half	amount of change
Dai-Ichi Kangyo	51.1	42.6	8.5	13.0	11.7	1.3	26.6	24.5	2.1
Fuji	54.9	62.0	−7.1	15.5	18.1	−2.6	29.0	25.9	3.1
Sumitomo	65.4	65.1	0.3	18.7	19.4	−0.7	30.7	34.7	−4.0
Mitsubishi	42.9	42.6	0.3	13.2	14.0	−0.8	21.4	21.5	−0.1
Sanwa	53.6	53.2	0.4	17.1	17.7	−0.6	26.5	27.1	−0.6
Mitsui	36.6	35.4	1.2	17.3	17.5	−0.2	18.5	18.1	0.4
Tokai	39.1	33.6	5.5	16.9	15.4	1.5	21.4	17.7	3.7
Taiyo-Kobe	25.3	23.1	2.2	11.3	10.9	0.4	12.9	12.4	0.5
Daiwa	15.8	13.9	1.9	12.1	12.6	−0.5	8.2	7.6	0.6
Kyowa	14.6	15.2	−0.6	10.5	11.5	−1.0	7.6	7.0	0.6
Saitama	12.3	9.6	2.7	9.3	7.9	1.4	6.8	5.5	1.3
Hokkaido Takushoku	12.9	11.4	1.5	12.1	11.3	0.8	6.9	6.0	0.9
Tokyo	134.8	122.4	12·4	80.8	76.8	4.0	70.2	64.6	5.6
average				19.1	18.8	0.3			

Source: Annual Report of the Ministry of Finance, 1984.

Table 3. Change of Foreign Loan Outstanding

3-1. Change of short-term foreign loan outstanding

End of year / Denominated in	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Foreign currency	15	47	60	80	91	92	94	119	151	225	339	403	448
Yen	—	—	—	—	0	—	2	3	1	4	14	18	21

Source: Anual Report of the Ministry of Finance, 1983.

3-2. Change of middle and long-term foreign loan outstanding

End of year / Denominated in	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Foreign currency	2	25	73	86	87	82	89	181	285	324	404	523	586
Yen	—	—	—	2	5	10	17	88	189	210	233	299	398

Source: Anual Report of the Ministry of Finance, 1983.

Table 4-1. Ratios of Working Balance and Operating Return Denominated in Foreign Currency (all banks)

(unit: %)

End of year / Items	1975 I	1975 II	1976 I	1976 II	1977 I	1977 II	1978 I	1978 II	1979 I	1979 II	1980 I	1980 II	1981 I	1981 II	1982 I
Ratio of average outstanding of working balance denominated in foreign currency to average outstanding of working balance	13.5	13.0	12.3	11.9	11.4	10.6	10.4	12.2	13.6	16.5	17.4	19.5	22.0	24.0	29.5
Ratio of operating return denominated in foreign currency to operating return	14.2	13.9	12.9	12.1	11.6	12.2	13.0	18.3	21.9	28.1	25.2	29.9	38.5	40.6	45.6

I: The first half period of a year
II: The second half period of a year
Source: The Ministry of Finance.

Table 4-2. Weight of International Business Affairs Sector (in the mid-1983 fiscal year)

	Ratio of working balance of international business affairs sector to outstanding of working balance (average outstanding)	Ratio of operating return in international business affairs sector to operating return	Ratio of gross operating profit in international business affairs sector to gross operating profit	oversea branches
All banks	29.9	36.6	11.6	5.7
City banks, Foreign exchange banks and Long-term credit bank	36.8	44.6	17.5	9.1

Note: Gross operating profit=operating return—(operating cost—reserves transferred for possible loan losses—other expenses)
Source: The Ministry of Finance.

Prof. E.S. Crawcour and Prof. H. Arndt, held at Australian National University in Canberra on October, 1983. We would like to express heartfeltly our appreciation on Prof. Crawcour kindly consideration and friendship that we have discussed fruitfully with many specialists in Australian academic circles and government officials.

The subject of the paper which we are going to give today is Internationalization of Japanese Commercial Banking—the recent experience of city banks in Japan. This is a summary of the results of our questionnair type of research work which we conducted twice, one is 1977–78 and the other in 1981–82. In this project we all of us here and two other professors participated.*** We have been working very closely since the making of the questionnairs, through the work of compilation of the responses and to the discussion about the summary of the results and its interpretation. Therefore this project is really a "joint product" of our cooperation, therefore the compution of each member's contribution to this project is very difficult to assess as it is said so in economics. However, the actual writing of the summary has been done by our working group, Prof. Fujita, Mikitani, Mizushima, especially Mr. Miyata, Ishigaki, Niwa, and Izawa.

Internationalization of Japanese economy, development of interdependent relationship between Japan and the rest of the world, and increasing importance of Japan's status in the world economy in the past twenty years, obviously have had a great effect upon the activities of various large banks, which have played a major role in the financial activities in Japan. For example, in the past 10 years, GNP increased by 3.3 times while the amount of foreign exchange transactions of all Japanese banks by 7.5 times, the foreign assets of banks by 12 times, and earning profit from international banking by 8 times. At the end of 1970, there were 58 overseas branches and 7 overseas local banks, however at the end of 1981, they increased to 151 overseas branches, 81 local banks and 196 representative offices.

The international banking business of Japanese banks has been expanding not only quantitatively, but also changing qualitatively. They have been multinationalizing quite rapidly.

In our survey we not only asked the bankers to respond to a questionnaire but also we interviewed them. Ten of the twelve city banks and one special foreign exchange bank cooperated with us in this survey. They account for about 84% of the foreign exchange asset balance and about 90% of all overseas branches of Japanese banks. Therefore it seems to be fairly reasonable to say that this survey would provide us a considerably accurate picture of internationalization of Japanese banking.

Generally speaking, the internationalization of finance has three aspects. Firstly,

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*** The other working members are Professor Yusaku Futatsugi, Professor Nobuo Miyata and Assistant Hideki Izawa.   They could not attend our Camberra seminar in last October.

it involves the internationalization of domestic currency ... that is, a domestic currency becomes also an international vehicle currency and reserve currency.

Secondly, it involves the internationalization of banks and other financial institutions—namely, they transact both domestic and foreign currencies with non-residents and residents. Thirdly, it involves the internationalization of money and capital markets—that is, both short-term and long-term funds move freely into and out of the markets across the borders of the countries, and interest rates are determined by market forces.

Of course these three aspects are closely inter-related with each other. On one hand the internationalization of a currency and of the money and capital markets promotes the internationalization of banking business. Conversely, the development of international banking contributes to the promotion of internationalization of the currency and the money-capital markets. However, one of the feature of the internationalization of Japanese banking is that it has developed without significant corresponding developments in internationalization of yen and the financial market in Japan.

2. The Purpose and Motives of Internationalization of Japanese Banking

Among the purposes and motives of internationalization of Japanese banking, earning of profit is, as a matter of fact, the most important, although the various other shorter-term objectives are subsumed in this profit motive.

Our survey (Fig. 1) indicates that the long-term percentage target of the profit from international banking which the city banks consider appropriate is between 11% and 30%. The upper-ranking group of city banks give a figure of 26–30%, the middle ranking group 21–25% and the lower ranking group 11–20%.

Besides profit earning, Japanese banks consider the following objectives as important; in order to enlarge the number of customers, the accumulation of techniques and 'know-how' in international banking is very important. Other objectives include collection of overseas information and the maintenance of banks' prestige among the competing banks. It seems to be interesting that the upper ranking group tends to emphasize enlargement of numbers of customers and accumulation of knowledge, on the other hand some middle and lower groups tend to give more weight to maintaining of their prestige.

Next, we would like to examine the motives and methods of internationalization of Japanese banking in the past. There are two main courses in internationalization of banking; one is; banks may internationalize itself in accordance with internationalization of their domestic business customers; the other is; banks may initiate internationalization by themselves. According to our survey, more than half of the

Figure 1. Actual and Target Profit Share

The upper group____ (1), (7), (9), (10)
The middle group____ (4), (6), (8), (11)
The lower group ____ (2), (3), (5)
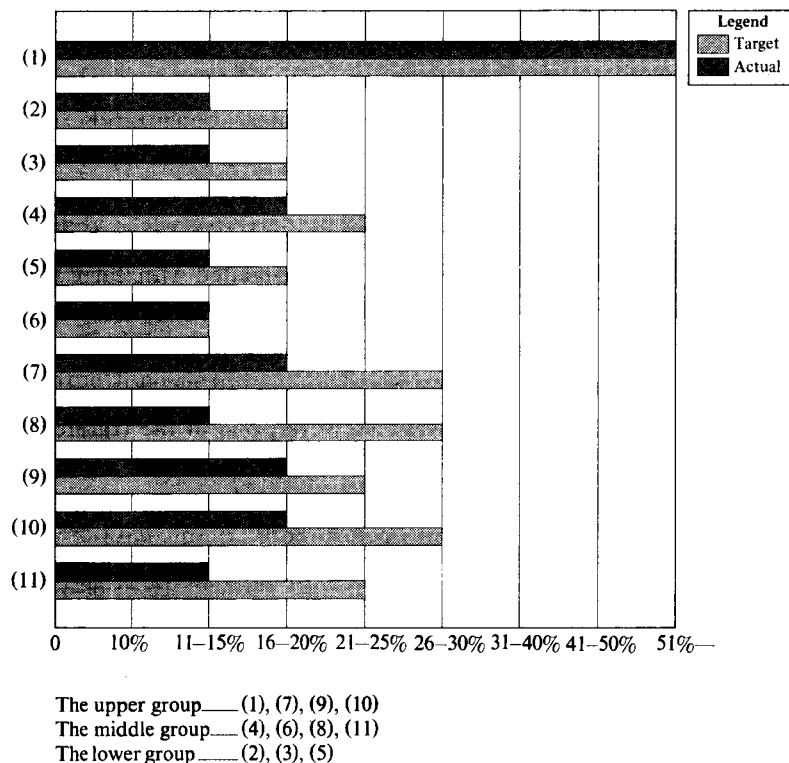
banks think the former is more significant, three banks consider the latter is more significant, and the rest of them stated that their internationalization had proceeded with their business customers together. Therefore, it seems to us that internationalization in Japanese banking has been primarily motived by, and proceeded together with, the internationalization of their Japanese business customers. We can say that liberalization of trade and capital transactions and an increase in overseas activities of Japanese business companies have resulted in an increase in demand for various foreign exchange dealings and finance of the banks.

However, this is not to say that self-initiated internationalization is an insignificant aspect of the internationalization of banking. For example, the specialized foreign exchange bank proceeded on its own initiative, competing with foreign banks in various aspect of banking business well before the internationalization of Japanese business companies. In the case of other banks, also, there are some examples of this type of internationalization—for instance, some Japanese banks have often helped customers in their internationalization, especially when a customer is of small or medium-size without sufficient knowledge of overseas conditions.

In addition, in early 1970s, when the financial market conditions eased due to

excessive domestic liquidity and they thought that the demand for investment funds was going to slacken for a long time to come, banks actively sought new field of business in the international finance market. Similarly, the easing of regulation on foreign exchange transactions since 1972 by Japanese monetary authorities helped Japanese banks develop international business.

3. Establishing Branches, Offices and Local Banks

In order to start international banking business in Japan, banks need to obtain an authorization from the monetary authorities to deal in foreign exchange. And then they have to establish foreign exchange sections within domestic banks and open a correspondence relation with foreign banks overseas. At the end of December 1981, there were 125 authorized foreign exchange banks. However, the establishing of overseas branches, representative offices and local banks is the main method of international banking. The overseas operations of Japanese banks, especially fund-raising and accomodation of funds, are conducted in foreign currency, usually U.S. dollars, the establishing of overseas branches and affiliates is critically important for international banking.

Table 5 shows the geographical distribution of overseas branches, offices, local banks and Japanese staff. In terms of the geographical distribution of overseas branches, North American has 31.5%, Europe 27.9% and Asia 31.5%—in total, these three areas cover 90.9% of branches. 39.5% of Japanese staff are located in North America, 34.1% in Europe and 22.3% in Asia. Representative offices are more scattered, with 19.7% in America, 23.8% in Asia, 18.4% in Central and South America, 15.6% in Europe, 8.8% in Oceania, 10.2% in the middle and Near East and 3.4% in Africa. The distribution in terms of staff is similar to the above. 40.3% of local banks are in Europe, 24.2% in Asia, 27.4% in North America, 8.1% in Central and South America. The distribution of Japanese staff, however, is very different—58.2% in North America, 22.2% in Europe and 11.5% in Asia. This indicates that local banks in North America are considerably larger than those in other countries.

In order to know the geographical distribution of overseas branches, offices and local banks we adopted the total number of Japanese employees as an aggregate measure. Column (4) of Table 1 tells us that North America as 41.4%, Europe as 28.4%, Asia as 19.7%, Central and South America as 6.7%, Oceania as 1.4% and the Middle and Near East as 1.1%. The first three areas together account for about 90%, and can thus be considered important areas. Oceania is only 1.4%.

Fignre 2 shows the relationship of the geographical distribution of overseas bases of banks (banking), trade, and direct investment overseas. In the case of North

Table 5. Geographical Distribution of Overseas Branches, Representative Offices, Local Banks and Japanese Staff

	(1) Branches			(2) Representative Offices			(3) Local Banks			(4) Total (overseas bases)
	I Branches	II Japanese Employees	III Employees of Local Nationality	I Representative Offices	II Japanese Employees	III Employees of Local Nationality	I Local Banks	II Japanese Employees	III Employees of Local Nationality	Total Japanese Employees
(A) North America	31.5	39.5	24.9	19.7	16.7	12.6	27.4	58.2	77.4	41.4
(B) Central and South America	7.2	3.3	7.8	18.4	19.8	18.3	8.1	8.1	10 9	6.7
(C) Europe	27.9	34.1	24.5	15.6	16.3	10.6	40.3	22.2	3.9	28.4
(D) Middle and Near East	0.9	0.6	0.2	10.2	10.8	12.3	0.0	0.0	0.0	1.1
(E) Asia	31.5	22.3	42.6	23.8	24.3	34.6	24.2	11.5	7.9	19.7
(F) Oceania	0.0	0.0	0.0	8.8	10.1	5.3	0.0	0.0	0.0	1.4
(G) Africa	0.0	0.0	0.0	3.4	2.1	6.0	0.0	0.0	0.0	1.2
(H) Others	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of Banks and Employees	111	1,215	6,164	147	287	301	62	554	11,744	

The second survey (1981–82)

Figure 2. Geographical Distribution of Overseas Bases of Banks, Trade, and
Direct Investment (the first survey 1977-78)

a. Southeast Asia
b. West Asia
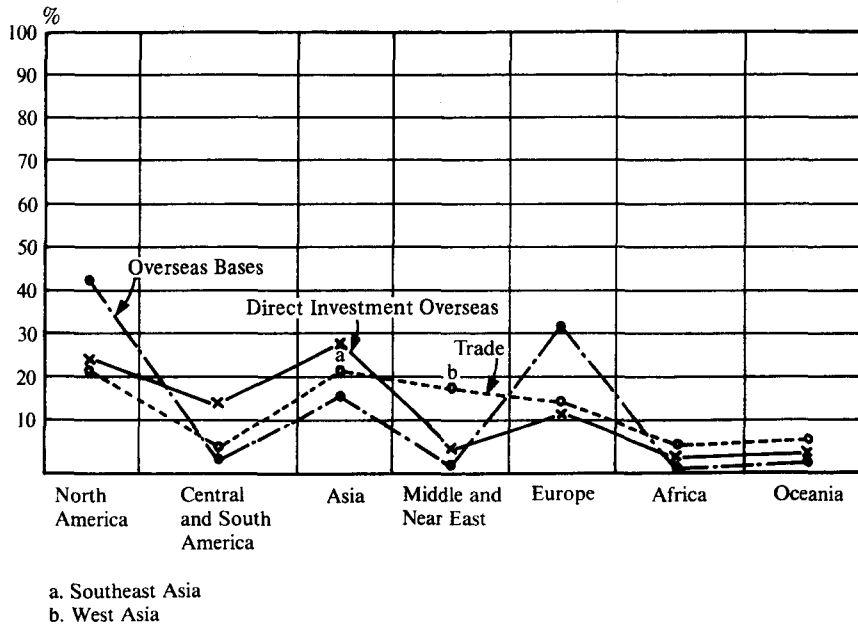
America and Europe, the figure for banking is considerably higher than those for trade and direct investment, while in the case of the Middle and Near East and other areas, it is considerably lower. This may mean that even if internationalization of Japanese banks began in response to internationalization of their customers, banks' internationalization has now taken some different direction from that of their customers. North America and Europe, in particular New York and London, are the two major international financial markets in which almost all fund raising and a lot of loan accomodation are conducted. It is interesting to note that the geo-graphical distribution of representative offices, whose main function is collecting information rather than conduction fund raising and loans accomodation, is similar to figures for trade and direct investment overseas. It should be noted, however, that the present pattern of geographical distribution of banking bases reflects the dicisions of banks within the framework of regulations and guidelines issued by authorities in Japan and overseas. It is quite likely that the present distribution may change with the progress of internationalization. The first survey shows that all Japanese banks want to establish new branches in the near future in North America, half of the banks want to establish branches in Europe and Asia, and a few want to establish branches in Central and South America, and the Middle and Near East. It seems, therefore, that North America will continue to be the most important area,

with Asia, the Middle and Near East, and Central and South America gaining in importance, and Europe possibly becoming less important in this regard.

However, our second survey shows that in the near future 9 city banks want to establish 19 branches in Asia and 10 banks in Australia (Sydney). Half of the banks want to establish branches in Central and South America, Europe, North America and the Middle and Near East. This would mean that for the present city banks complete to establish new branches in the international financial center, and turn their eyes to Asia, Oceania and many principal cities in the world.

These conclusions are based only on predictions of the future distribution of branches of Japanese banks which are already internationalized, or in the process of internationalizing. We do not take into account other banks, especially large regional banks and mutual loan and savings banks, which may establich overseas branches in the future. If they want to establish branches in the international financial markets, particularly in New York and London, the future disturbution of branches of Japanese banks will not change as much as indicated earlier. Our survey suggests that recent years, Japanese city banks want to establish new representative offices in socialist countries (China and Soviet Union), but distribution of representative offices will not differ greatly from the present pattern. This would reflect the fact that the function of these offices is not to conduct financial business themselves, but to collect local information on the region in which they are established.

In the case of the establishing of local banks, Japanese banks must consider the advantages and disadvantages of establishing a local bank as opposed to a branch. Our research indicates that the main advantage of local banks as compared with overseas branches is that they are able to conduct various financial dealings in accordance with local regulations and economic conditions, independent of official Japanese control. The main disadvantage is that local banks cannot benefit directly from economies of scale and the credit power of the parent bank because, legally, local banks must be independent of the parent bank. In fact, however, because of controls imposed on financial activities by both Japanese and overseas authorities, there is often no alternative but to establish a local bank. For example, Japanese banks are not permitted to engage in securities business both domestically and overseas, so it is necessary to establish local banks abroad to carry out this business. Similarly, regulations prevent the establishing of new branches of foreign banks in Australia, so foreign banks are compelled to establish non-bank financial companies (merchant banks, finance companies) instead.

4. The Operation of International Banking

There are several phases in the process of internationalization of banking. Table 6

Table 6. Phases of Internationalization of Banking

Phases	The 1st Phase (National Banking)	The 2nd Phase (International Banking)	The 3rd Phase (in a broader sense)	
			The 3rd Phase (International full-service banking)	The 4th Phase (World full-service banking)
Internationalization of Customer Companies	Export-Import	Active Direct Overseas Investment	Multinational Corporation	
International Operations in Banking	Mainly foreign exchange operations connocted with foreign trade. Capital transactions are mainly short-term ones.	Overseas loans and investments become important and medium- and longer-run capital transactions become important.	Non banking fringe activities such as merchant-banking, leasing, consulting, and others are conducted.	
			No retail banking	Retail banking is done
Methods of Internationalization	Correspondence contracts with foreign bank	To strengthen own overseas-branches and offices	By strengthening of own branches and offices, capital-participation, affiliation in business, establishing non-bank fringe business firms, the most profitable ways of fund-raising and lending are sought on a global basis	
Customers in International Operations	Mainly domestic customers	Mainly domestic customers	Customers are of various nationalities	

Source: Mitsubishi Bank, *Chosa*, September 1974.

Table 7. Alternation of Treatment by the Type of Transaction

Type of Transaction	Alternation of Treatment	Amounts (million dollar)		
		During 1980	During 1981	Rate of increase
(1) Impact loans (foreign currency loans to residents)				
Short term	Individual permission ⟶ Liberalization	2,174 (1,071)	11,072 (9,455)	5.1 times 8.8 times
Medium and long term	,, ,,	2,245 (2,041)	△1,550 (△1,293)	—— ——
(2) Foreign currency deposits by residents	Limit 3 million yen ⟶ ,,	3,753 (2,314)	4,792 (3,981)	+28% (+72%)
(3) Borrowings between firms				
Short term	Individual permission ⟶ Prior notification	3 (—)	573 (518)	
Medium and long term .	,, ,,	71 (69)	207 (185)	2.9 times (2.7 times)
	(domestic direct investments are examined)			
(4) Loans between firms				
Short term and medium and long term (excluding direct investments)	Individual permission ⟶ Prior notification (with examination)	19 (—)	824 (809)	
Medium and long term (direct investments)	Individual permission ⟶ ,, (restricted type of industry)			
	Automatically permission ⟶ ,, (general type of industry)	1,799 (2,081)	3,473 (3,240)	1.9 times (+58%)
(5) Issue of foreign bonds in domestic currency	Permission with the payment of issue price ⟶ Prior notification (with examination)	1,115	2,871	2.6 times
(6) Loans to foreign countries	Permission ⟶ ,,	in yen 194 billion yen	464 billion yen	2.4 times
	(main Japanese banks are generally permitted) ⟶ (main Japanese banks need not to notify)	in foreign currency 6,704	12,688	1.9 times

(7) Issue of foreign bonds (private cooperate bond, government guaranteed bond)	Permission ⟶ Prior notification (with examination)	3,522 debenture 673 convertible bond 2,413 government guaranteed bond 436	4,697 333 3,901 464	+33%
(8) Domestic security investment (excluding T.B. conditional transaction of bonds)	Approval and permission ⟶ Prior notification (automatically approved and permitted in principle) (via designated security company need not to notify)	10,318 stock 4,988 bond 5,330	9,294 3,523 5,771	
(9) Foreign security investments (excluding T.B.)	Permission ⟶ " (comprehensive permission in principle)	2,912 stock △344 bond 3,255	6,048 240 5,808	
(10) Conditional transaction of bonds by non-residents	Permission ⟶ " (automatically permitted in principle)	73	3,224	
(11) Domestic direct investments (stocks and equities)	Approval ⟶ prior notification (with examination) (automatically approved in principle)	328 establishing branches 54	389 95	+19% +76%
(12) Foreign direct investments (aquisition of securities, establishment of branches)	Permission (restricted type of industry) ⟶ " Notice (general item)	2,211	3,354	+52%

Source: T. Kato, *The Development of International Financial Policy*, 1983.

shows the content of each phase in terms of the internationalization of customer companies, international banking operations, method of internationalization and the customers in the international operation.

In the first phase, the initial step is an internationalization of customers themselves. Here the customers are mainly engaged in import and export transactions with foreign companies, therefore the most important aspects of international banking are foreign exchange operations connected with foreign trade. Capital transactions with customers are limited to finance trade that is mainly short-term finance. In this phase, the main method of internationalization is to make correspondence contracts with foreign banks. In the second phase, as the bank-customers' direct investment to overseas increases, banks increase their loans to Japanese affiliated companies relative to foreign exchange business. Medium and long-term capital transactions increase correspondingly. Banks aim to internationalize their business by building up a network of overseas branches and representative offices. In the third phase, the multinationalization of big business develops, and foreign as well as Japanese companies become bank customers. International business extends to non-banking activities, such as merchant banking and leasing, through the strengthening of branches and offices, capital participation, business affiliations and the establishing of non-bank business firms. Banks seek the most profitable ways of fund raising and lending. In the fourth phase, retail banking is to be conducted on the worldwide basis and the content of international operations and the methods of internationalization make more advance and become more complex. An aspect of the fourth phase which distinguishes it from the third phase is the declining importance of the exploitation of new businesses and methods for the banks, and more concentration on deepening and strengthening of the activities already commenced in the third phase. This may be revealed in terms of an increasing ratio of international transactions to the total transactions of the banks (Table 7).

Now look at Figure 3. Our research shows that in 1977–78, four banks were in the fourth phase, five in the third and two in the second—in other words, on average, banks have reached the third phase of internationalization. Our second survey shows that in 1981–82 six banks were in the fourth phase, and five in the third. Comparing these two surveys, the internationalization of Japanese banking has been steadily advancing. Our survey also confirmed that the internationalization of Japanese banking had progressed rather slowly prior to the 1970s, but rapidly in the first half of the 1970s, before slowing down again in the late seventies.

What attracted the Japanese banks into international operations? Our survey indicates that the major attractions for them are (i) diversification of banking operations and customers (ii) higher profits (iii) high potential for growth and (iv) access to large, flexible and free international finance markets. These attractions of

Figure 3. Development of International Banking
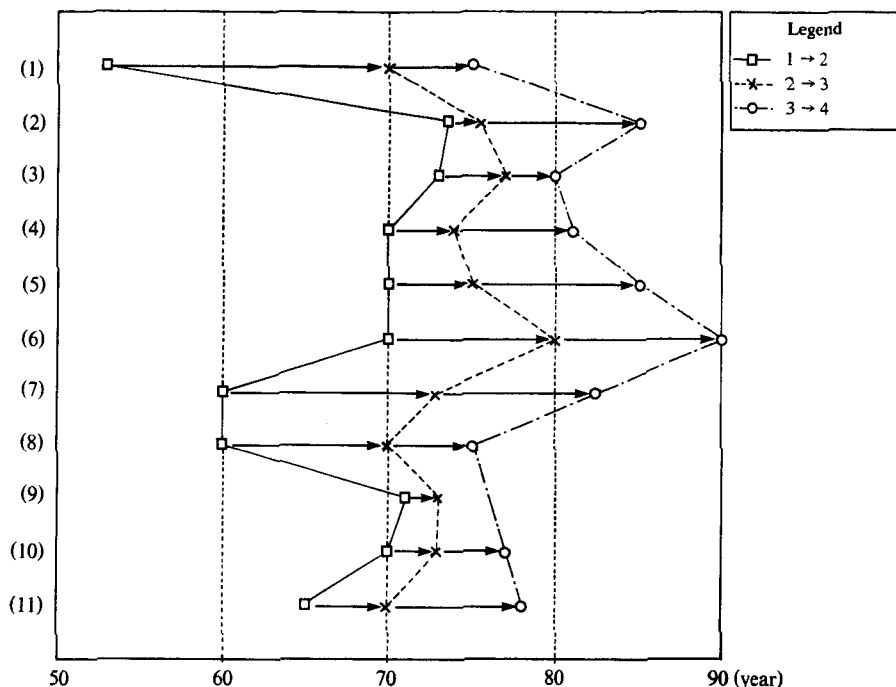
international banking have been motivated by both short-term objectives and long-term objectives of the banks. It should be noted, however, that risks which are absent in domestic banking, such as exchange risk, country risk and availability risk, are present in international banking. Moreover, competition is much more keen in the international market, which is a free market by nature. And there is no lender of last resort in the international sphere.

As mentioned previously, Japanese banks have branches in various countries to carry out their international business. We will now examine the relative importance of banking business at the New York, London and 'others' branches (Table 8).

At the New York branch, the order of importance in 1977–78 was that trade finance was the most important, and loans to Japanese affiliated companies were in the second place and fund raising was the least important among them. The situation changed greatly in 1981–82. Loans to non-Japanese companies are now the most important, and loans to Japanese affiliated companies follow. Trade finance becomes the least important. At London branch, on the other hand, fund raising was by far the most important activity, and it is still in 1981–82 the most important business. However, the second importance shifted from trade finance to loans to other companies. This seems to suggest that some Japanese banks have already developed various kinds of international banking operations in the international financial

Table 8. The Order of Business in each Branch

	The first survey (1977–78)	The second survey (1981–82)
New York Branch	(1) Trade Finance (2) Loans to Japanese affiliated companies (3) Fund raising	(1) Loans to other companies (non-Japanese) (2) Loans to Japanese affiliated companies (3) Trade Finance
London Branch	(1) Fund raisng (2) Trade Finance (3) Loans to other companies	(1) Fund raising (2) Loans to other companies (3) Loans to Japanese affiliated companies
Other Branch	(1) Trade Finance (2) Loans to Japanese affiliated companies (3) Fund raising	(1) Loans to Japanese affiliated companies (2) Trade Finance (3) Loans to other companies

markets. At the other location of branches, the ranking of activities was approximately similar to that of the New York branch.

From the result of this survey we can draw a tentative conclusion that through their net works of overseas branches the banks raise funds at London branches and make use of the funds for trading finance, loans to both Japanese affiliated companies and non-Japanese companies through New York and other branches.

Figure 4 and 5 show the geographical distribution of fund raising for overseas operations. Almost all funds for overseas operations are raised by overseas branches, and the funds supplied by head office are surprisingly little. Japanese banks raise about 55% of funds in Europe, 30% in America, 15% in other regions and in head office. This is consistent with the description of London branch activities given above.

Figure 6 shows the maturity structure of the raised funds. About 80% of all funds are short-term (within 12 months), 20% are long-term. Generally speaking, in the case of upper-rank banks, the figure of long-term is less than 10%.

Now we turn to the use of funds for international business, we note that the main banking business related to the use of funds is dealing in foreign exchange, trade finance, loans to non-residents and merchant banking. The first item, dealing in foreign exchange, is growing steadily with the growth of the Japanese economy and foreign trade, and because it remains a fundamental operation of international banking business the stability and certainty of these dealings is very high. However, its relative importance has been decreasing due to the rapid increase in loans activities. The ratio of the trade bill in foreign assets of all banks was about 80% in September 1970; this fell to about 35% by September 1978. This is due to the growing importance of loans to non-residents.

Figure 7 shows the distribution of loans among developed, developing and

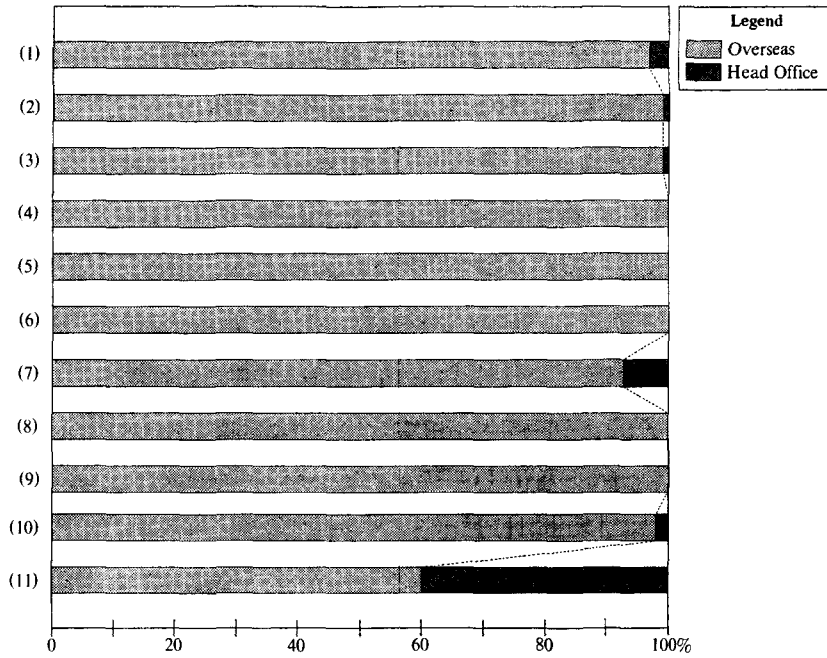**Figure 4. Sources of Funds for Overseas Operation**

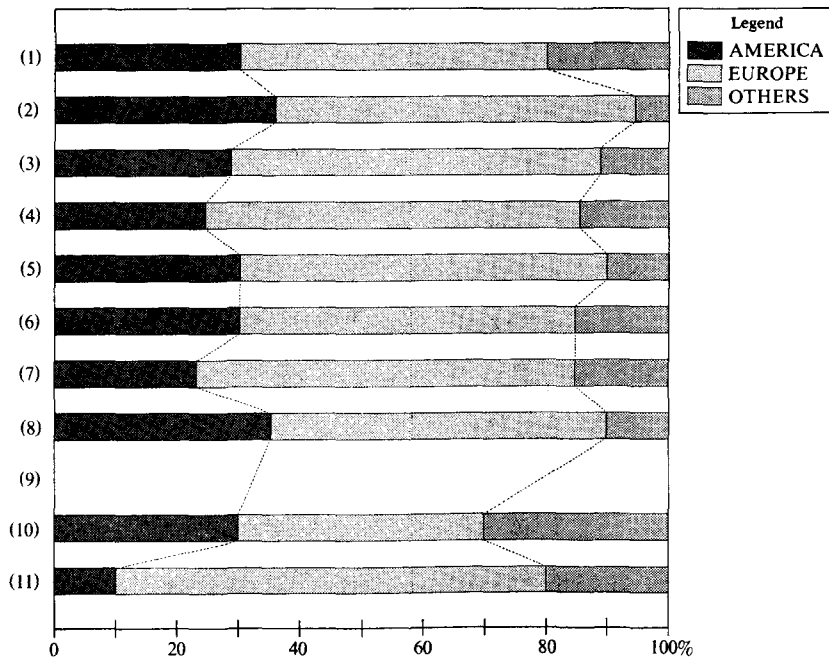**Figure 5. Geographical Distribution of Fund Raising**

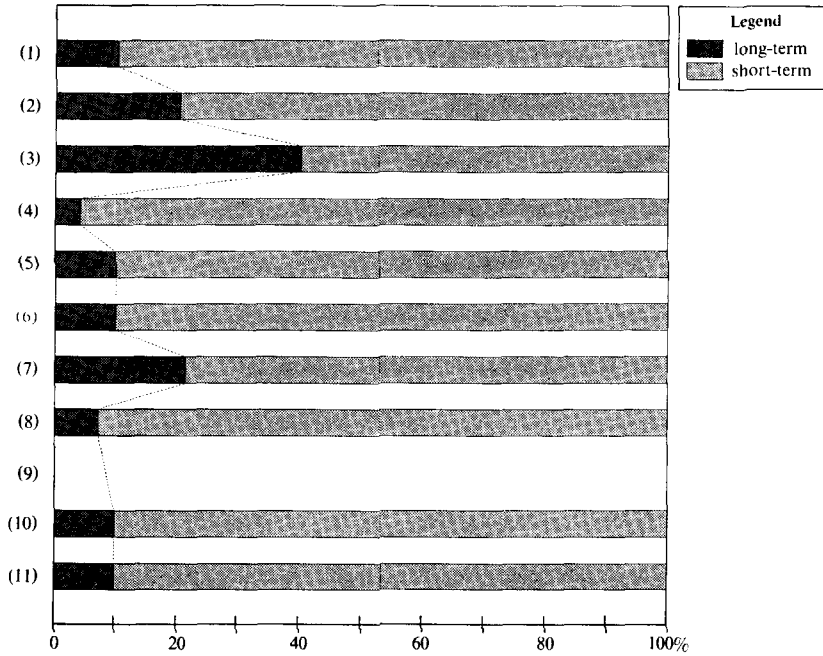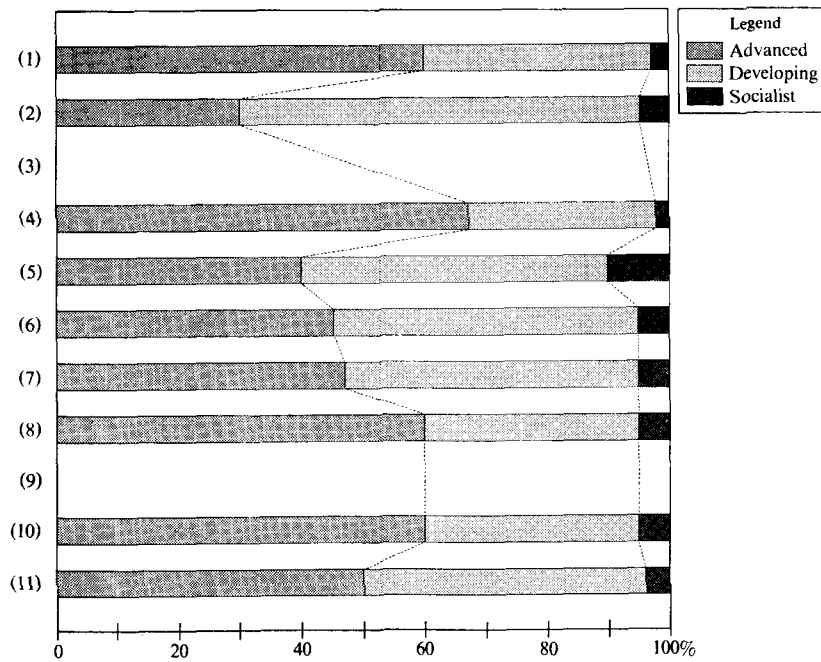Figure 6. Maturity Structure of Funds Raised

Figure 7. Geographical Distribution of Loans

socialist countries. The developed countries' share is about 60%, that of developing countries is 35% and socialist countries 5%. It should be noted that the combined total of loans to developing and socialist countries amounts to 40%. According to our research, four out of ten banks want to increase the volume and share of loans to developing countries, and three want to increase the volume without changing the share. It can be said, therefore, that Japanese banks generally have an aggressive attitude towards extending loans to developing countries, despite the greater risk that may often be associated with such loans. These risks comprise both individual credit risk and country risk. It is interesting to note that banks which are already lending about 40% of their loan funds to developing countries do not, according to our research, wish to increase the share of developing countries more. This might presumably reflect the rapid increase in the marginal risk of this sort.

Figure 8 shows that the share of loans to Japanese affiliated companies and to non-Japanese companies is about 30% and 70% respectively. This confirms that the internationalization of Japanese banks has already reached the third of fourth phase. Although almost all Japanese banks place considerable importance on existing relations with Japanese customers when accommodating loans to Japanese affiliated companies overseas, they do not always insist on the past and existing customer relationship in Japan. This means that the Japanese banks are trying to acquire new

Figure 8. Share of Loans to Japanese Affiliated Companies
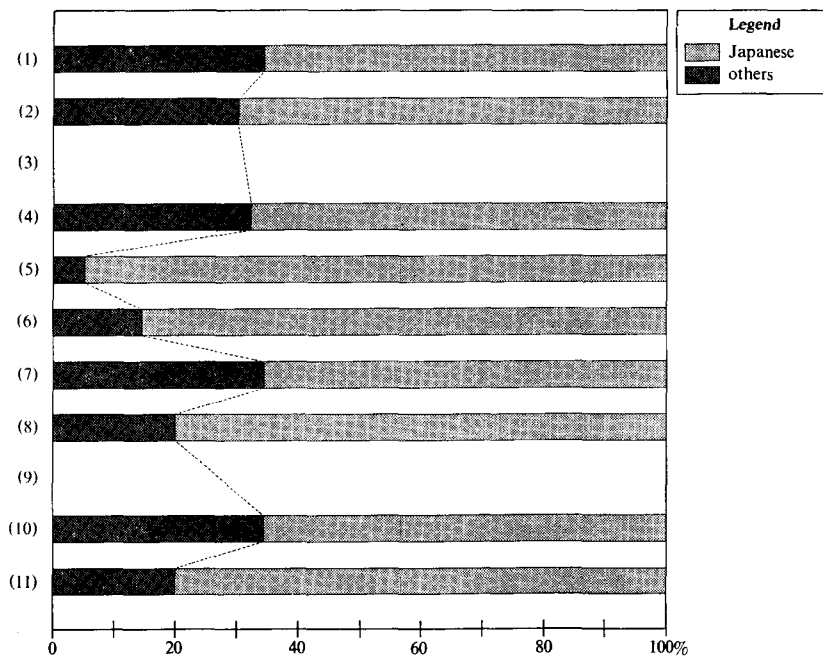
customers through international finance activity.

Between our two surveys the share of loans to non-Japanese companies increased greatly. This is an evidence of further progress of the internationalization of the Japanese banks.

Figure 9 shows the maturity structure of loans. The percentages of short-term and long-term loans vary among the banks, reflecting the international lending policy of each bank. Roughly speaking, the share of short-term is 45% and the long-term is 55%. Figure 9 indicates that the Japanese banks are conducting a kind of "maturity transformation" by borrowing short and lending long. According to our survey, Japanese banks accept this transformation as one of the functions of banks but they are also worrying about it.

All banks are interested not only in trade finance and loans to non-residents but also in other related business, such as merchant banking, securities business, leasing, credit cards and so on. Among these, securities business and merchant banking are particularly important for them. Almost all banks express their strong interest in securities business.

Recently the syndicate loans and project finance have been becoming very

Figure 9. Maturity Structure of Loans
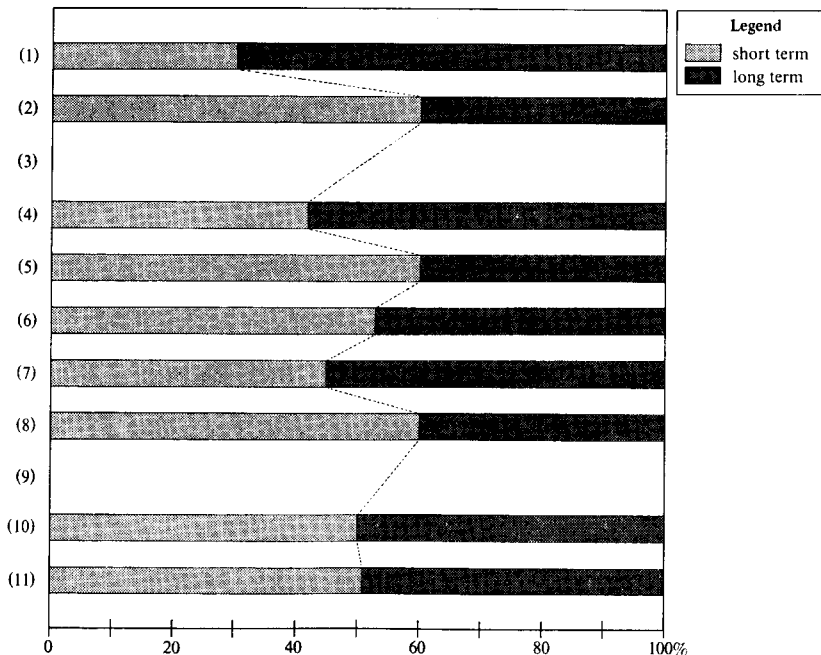
important. Therefore the knowledge and know-how of merchang banking are becoming very much in need.

5. The Performance of Internationalization

In this section, we examine the performance of internationalization in Japanese banking.

In accordance with the progress of internationalization of Japanese banks, profits from international activity are increasing steadily and contributing to total bank profits greatly. In 1982 the total bank profits of 13 city banks increased by 21.0%, meanwhile profits from international activity by 38.2%. The profits from the commission fee of international business did not change so much, but they had a remarkable increase in profits from loan and investment.

Table 9. Profits of International Sector in Japanese City Banks

Banks	Gross business profit (billion yen)		International section		Share of international section (%)	Amounts of foreign exchange transaction (million dollar)
			Loans and investment	Commission		
(1)	159	122	101	22	76.8	201,956
	157	107	83	24	68.1	182,675
(2)	133	15	13	2	11.5	27,155
	117	11	9	2	9.6	20,997
(3)	111	14	12	2	12.6	39,457
	109	12	10	2	10.8	29,161
(4)	203	35	31	5	17.5	106,494
	174	28	23	5	16.1	95,684
(5)	212	23	20	3	10.9	50,114
	185	20	17	3	10.6	42,765
(6)	219	34	28	5	15.4	99,551
	191	26	20	5	13.4	74,950
(7)	301	53	46	8	17.7	139,585
	247	3⟩	32	8	15.9	137,885
(8)	305	43	37	6	14.0	111,507
	261	35	31	4	13.4	88,344
(9)	336	65	57	9	19.4	125,114
	276	50	42	7	18.0	106,286
(10)	342	62	55	7	18.1	157,688
	281	44	37	7	15.5	122,700
(11)	365	43	35	8	11.7	120,877
	321	39	31	8	12.0	106,886
(12)	101	11	10	1	11.3	28,568
	85	8	7	1	8.8	17,029
(13)	122	10	9	1	7.9	34,081
	98	7	6	1	7.6	19,313
Total	2,907	530	452	78	18.2	1,242,147
	2,403	384	346	77	15.9	1,044,675

Note: upper raw 1982, lower raw 1981
Source: *Shukan Toyo Keizai*

Table 9 shows the profits from international section of Japanese city banks, compiled by Toyo Keizai Shimposha. The proportion of profits from international section to the total profits of the banks in 1981 and 1982 ranges from about 10% to 15%, excepting the Bank of Tokyo which is the special foreign exchange bank. Comparing actual figures with the feasible targets for profits in our survey shown in Figure 1, the feasible target exceeds the actual figure by 5–10%. The gap between the actual and the target value is higher for the upper ranking banks than for the middle and lower ranking banks. 10% as opposed 5%. This may suggest that the upper ranking banks are more willing to internationalize.

6. Difficulties and Limitation in the Internationalization of Japanese Banking

There are two types of limitations in the process of internationalization of banking-internal and external. Internal limitations are basically management problems while external limitations arise from general economic conditions and various regulations imposed on banks. According to our survey, the main internal limitations as perceived by the banks are, in order of importance, the shortage of staff competent to carry out internationalization, the inability to collect adequate information and know-how, the lack of an adequate system of operations for internationalized banking business and cost of establishing foreign bases, such as branches, representative offices and local banks.

The shortage of competent staff is the greatest concern of bankers. As mentioned earlier, as internationalization proceeds, the international banking operation becomes more complicated, moving from mainly foreign exchange and trade finance business to loans to non-residents and to syndicated loans business. For example, in any project involving the development of resources, finance is extremely important, and banks must play an important role. This extends from the funding of the project through to playing a role in its formation, promotion and programing, as well as supervising its progress. It is thus necessary for banks to have staff competent in the fields of economics, finance, tax, law, information collection, research and investigation, and business administration. Many banks feel that to obtain specialists in these areas in a matter of urgency.

As is generally known, a system of 'life time' employment prevails in Japan. It is thus quite difficult for banks to snatch off the competent staff from the 'outside'. An exception is some senior staff from monetary authorities. Consequently, it is unavoidable for most banks to train their own staff by sponsoring their study at overseas universities, by training them in overseas banks or by providing inhouse training. It takes considerable time and money, for a bank to secure a personel who

has the high level of expertise in international banking. This is putting Japanese banks at a disadvantage position in promoting rapid internationalization. However it might possibly become their long-term advantage if the trained staff are to remain in the bank and contribute to its international activities over a span of years. The bank can harvest the fruit of investment in human capital.

Secondly, information and know-how on international business are extremely important in terms of the development of international banking operations and in assessing and avoiding the associated risks. The lack of such knowledge within their operations is a concern to banks. As mentioned earlier, Japanese banks make use of foreign currency in their international operations. This gives rise to exchange risk and availability risk. In addition, with the increase of non-Japanese firms (including foreign governments) as customers, the big rise in loans to developing countries and the increase in long-term and large-scale loans for resource development, it has become increasingly necessary for banks to collect authentic informations promptly and to analyse them rightly. It is therefore necessary for banks to collect contemporaneous and comprehensive informations on the politics and economy of the foreign countries as well as on the individual customers. To obtain sufficient and prompt information and to acquire "know-how" on international finance seems to be one of the main present limitations to the future development of internationalization.

The third internal limitation perceived by banks was the lack in an adequate system of operation for international banking business. Japanese banks intend to overcome this problem by localization of the banking operation—that is, ensuring that the operation conforms with the culture, national character, economic practices and law of each country, and providing clear—cut definitions and the assignment of broad powers to the local staff in charge.

The fourth limitation is the costs of establishing overseas bases, such as overseas branches, representative offices and local banks. The Japanese banks tend to establish their overseas bases in the same place where rival Japanese banks have their bases. Therefore, Japanese banks, particularly lower ranking group, are compelled to establish foreign bases, even if unprofitable, in order to maintain their prestige. These behaviores are being re-examined by themselves recently.

There are also three external limitations on the internationalization of banking, according to our research namely, general world economic conditions which are reflected in the economic growth rate, price level, exchange rate, interest rate and so on of individual countries and the international market; the Japanese economic situation, which is reflected in the position of the Japanese economy in the world economy; and the regulations and administrative guidelines from Japanese and overseas authorities on international banking operations.

In the 1970s when the internationalization of the Japanese banking was increasing rapidly, the world economic situation was not as good as it had been in the 1960s. It was characterized by turbulence of the international monetary system, the introduction of the floating exchange rate system, the oil crisis and skyrocketing oil prices, unrest in the financial system due to the bankruptcy of the Herstatt Bank, high interest rates and the co-existence of high inflation rates and increased unemployment. The general economic situation had effects on both developed and developing countries, especially the latter, with countries like Turkey, Peru, Brazil, Mexico and Poland having difficulties with debt repayment. The prospect for the 1980s is not particularly optimistic, which may be disadvantageous for the internationalization of finance activities, with economic depression making it more difficult to measure country risk.

Japan was no exception in experiencing the difficulties of the world economy. The oil crisis at the end of 1973 and the failure of economic management caused the Japanese economy to get into difficulties, negative economic growth and skyrocketing prices. However, the Japanese economy fared reasonably well in the 1970s, compared with other developed countries, with her ranking based on GNP, trade and capital exports rising. As mentioned earlier, the internationalization of Japanese banking was promoted by the internationalization of the Japanese economy. However, it is not certain whether this pattern can continue in the 1980s. The growth of the Japanese economy in the midst of the stagnation of the world economy, which formed the background for the internationalization of Japanese banking, depended on overseas rather than domestic demand. For this reason, it is said that Japan's pattern of economic growth and the so-called 'closed market' have produced considerable friction between Japan and other developed countries. If the Japanese economy must in future depend much more on the domestic market and less on overseas markets, the incentive for internationalization of Japanese banking from the economy will weaken. However, it may be that the problem of friction over trading issues will be settled through the increase of overseas investment, and that the incentive will continue to work. Even so, it will be necessary for Japanese banks to find ways of diversifying their business with non-Japanese firms in order to develop the internationalization.

Besides the economic conditions surrounding Japanese banks, financial conditions, especially the internationalization of the yen, are very important in considering the internationalization of Japanese banking. One of the features of the internationalization is that Japanese banks have promoted it through making use of foreign currency, without any significant internationalization of the yen. This pattern of internationalization places Japan at a disadvantage compared with American banks, in that the latter can use its domestic currency as international

currency, which is not possible for Japan. According our research, almost all bankers think the internationalization of the yen, and thus the internationalization of the money and capital market, is extremely important as it will enable them to enjoy the same advantages (easiness, stability and efficiency in the use and raising of funds) as the American banks. It should be noted, however, that some banks (for example the specialized foreign exchange bank) have attained a similar level of internationalization as American banks without the internationalization of the yen, demonstrating that it cannot be regarded as a pre-requisite for the internationalization of Japanese banking. In addition, it would be simplistic to discuss the internationalization of the yen solely in terms of the internationalization of Japanese banking, as the former would have widespread effects on the balance of payments, monetary conditions and the financial market, and the management of monetary policy in Japan. Viewed in this light, it is possible to understand the argument of some banks that the internationalization of the yen is a different problem from the internationalization of banking. However, in general terms, it seems that, for the reasons mentioned above, the former does promote the latter.

The third external limitation on internationalization is the various regulations and guidelines imposed on Japanese banks. Almost all banks think that regulations on foreign exchange operations, the establishing of overseas bases and other international banking operations constitute a significant limitation. In particular, many banks are greatly concerned about the regulation of the establishing of overseas bases, because this is the way they have pursued their internationalization.

According to our research, almost all banks (eleven banks) agree that the present licensing policy of the Japanese monetary authorities regarding the establishing of new overseas branches (the so-called 'one new branch every two years' license) should be liberalized. One bank regards the present policy as good, while another thinks it should be strengthened because of the undue competition between Japanese banks, which was reflected in the Japan rate in the Euro-dollar market in 1974, and the low-interest lending rates in the American market in the late 1970s. It is natural that some banks are concerned about the market disorder brought about by such behaviour, and this illustrates one of the features of Japanese banks' behaviour— yokonarabi ishiki, worrying about comparison with other banks. However, even if such undue competition does exist, it is by no means certain that the cost of competition exceeds the benefit, or that strengthening controls on establishing branches would solve the problem. One of the important factors for the development of the international finance market is that it is a 'free' market, regulated not by controls, but by rational and prudent management on the part of the banks themselves.

The second aspect of regulation of internationalization is the exchange control. As mentioned previously, in December 1979, the foreign exchange law was revised,

leading to 'free foreign-exchange dealing in principle'. However, in case of emergency such as international financial crisis, the regulation on the foreign exchange position and the prohibition of paying interest on deposits of non-residents will be put into force by the monetary authorities. In regard to the necessity of the regulation in case of emergency, our survey indicates that all banks consider it necessary, if international financial disorder and the great disturbance in the foreign exchange market should occur. On the regulation of foreign exchange position of banks, almost all banks except two consider it necessary to maintain the stability of financial market and the soundness of banking. And on the prohibition of paying interest on deposits of non-residents in case of international crisis, all banks consider it unnecessary or doubt its effectiveness.

A further guidelines relates to securities. The present laws prohibit bankers from dealings in securities, and this principle is also applied to overseas banking. Japanese banks cannot do the securities business except through local finance companies, even if the monetary authorities in the foreign country are willing to permit it. Due to this quideline, Japanese banks are in a disadvantageous position compared with foreign banks, which can issue both debentures and syndicate loans. The reason for this guideline is the policy of separation between secutities dealing and banking. The policy that the maintenance of domestic financial order has been taking precedence over the development of international banking is now one of the concerns to bankers.

7. Some Conclusions

The main points of this paper can be summerized as follows.
1. The internationalization of Japanese banking has developed primarily due to the development and internationalization of the Japanese economy itself (, although there are some aspects in which the banks have taken the initiative towards internationalization).
2. A feature of the internationalization of Japanese banking is that it has not been accompanied by internationalization of the yen or the money and capital market.
3. By establishing overseas branches, representative offices and local banks, Japanese banks raise funds in foreign currencies through the international market, especially London branches, and lend funds to Japanese and non-Japanese firms overseas through other branches, especially in New York.
4. The present phase of the internationalization of Japanese banking is the third or fourth phase (, in which banks enlarge the number of their customers to include both Japanese and non-Japanese firms, and to diversify their business to include merchant banking etc. By strengthening their branches and representative offices,

they seek to globalize their profits by improving and extending capital parti-
cipation, business affiliations, fund-raising and so on). The ratio of international
business to total banking business for Japanese banks is considerably lower than
that for major American and European banks (although the size of the inter-
national business carried out by Japanese and major European banks is similar).

5. Some limitations and problems facing the development of the internationalization
of Japanese banking exist. Firstly, it will be necessary to train competent staff
and establish an operational system to cope with increasingly diverse and complex
international business. Secondly, the economic circumstances which fostered the
development of the internationalization of Japanese banking will change,
providing a bleaker environment with the prospect of problems such as friction
over trade issues and increasing protectionism. Thirdly, despite the liberalising
of previous controls on international banking which should stimulate the inter-
nationalization of the yen, the Japanese money and capital market and, con-
sequently, Japanese banking, problems may arise as banks have to practise self-
regulation. Fourthly, despite liberalization, there are still some areas (such as the
securities business) in which the domestic finance system takes precedence over
standard international banking practice.

In summary, Japanese banks will face intense competition in international
banking business in an economic environment which is at once more harsh and more
liberalized. In order to survive in these conditions, Japanese banks will need to be
self-reliant, which depends on their ability to acquire competent staff and establish
an effective system of international operations.

8. Some Remarks on the Internationalization
of Japanese Life Insurance Industry

Now the Japanese life insurance industry takes a great interest in the Australian
economy as the investment outlet of its funds. As you have already known, Japanese
economy has experienced rapid growth in two decades since sixties, and the life
insurance business developed in a much higher pace than was the case in the national
economy.

In these years, as the world economy stagnated and the trade friction intensified,
the Japanese economy has been in the recession, too. So individual consumption,
housing investment and plant and equipment investment levelled off substantially.

In spite of such an economic climate, new business of the life insurance industry
showed recently a fair increase mainly because of the premium reduction as well
as the intense sales efforts of individual companies.

The Business in force as of the end of fiscal year 1981 amounted to about $A3

trillion, more than three times of the national income, which is at the top level in the world. The total life insurance assets exceeds now $A140 billion.

The Japanese life insurance industry did not handle the foreign investment at all until a few years ago. This changes result from firstly the fact that because of continuing stagnation of Japanese economy there are not given so many gainful investment opportunities in the interior. Secondly there are circumstances that they will be able to expect good performance as to yeild through the large difference in the interest rates, even if they take account of the risks of foreign exchange rate fluctuations.

Thirdly I would like to point out another reason for the increasing overseas investment, that is, a precautionary measure against an eventful earthquake disaster, which is feared to occur in the near future. It might be said a strategy from the viewpoint of portfolio risk management.

Generally speaking, there are two types of Japanese life insurers' foreign investment: securities holdings, most of which are of fixed interest and loans. The former is used to be done in term of foreign money, the latter usually in Japanese Yen.

While the total holding of foreign securities, esp., bonds was only 2% of total life funds in 1979, it increased up to more than 6% in 1982, or three-fold increase as to ratio to the total funds. On the other hand, the overseas loans have remained about 2%. It must be emphasized that only in a few years the total of the overseas investment rose considerably from $A2.4 billion to over $A4.5 billion, that means increase from 4% to 8.5% of total life insurance funds.

When ratios of the overseas investment increment to the added funds in each year are to be shown, one can visualize more clearly the posture of Japanese life insurers in this field. As far as their securities acquisition in concerned, the ratio rose by 13% in two years, namely, from 4% in 1980 to 17% in 1982, while in the same period the overseas loan showed the growth from 1.5% to 4% of new funds. As a result of this development the Japanese life insurers invest at the end of fiscal year 1982 as much as 20% of newly increased funds to capital and financial markets in foreign countries.

As concerns Australia, most major life companies in Japan are used to appreciate it as one of the best investment outlet in the world. So Australia has the second ranking next to Canada.

The recent statistics shows that total investment outstanding to this country as of the end of June 1983 has the proportion of 13.2% in the total overseas investment of Japanese life offices, which amounts to $A15 billion. I would expect that this situation would last further in the future yet.

The members of our research group are Professor M. Fujita, *Kobe University*, Professor K. Mizushima, *Kobe University*, Professor R. Mikitani, *Kobe University*, Professor Y. Futatsugi, *Kobe University*, Professor N. Miyata, *Kagawa University*, Associate Professor K. Ishigaki, *Kobe University*, Associate Professor N. Niwa, *Toyama University*, Associate Professor K. Shimomura, *Kobe University* and Assistant H. Izawa, *Kobe University*. Moreover, these all members belong to Special Committe of International Finance, Research Institute for Economics and Business Administration, Kobe University which Professor Fujita serves as the chief of this committee. Especially, we do deeply appreciate for Mr. Miyata, Mr. Ishigaki, Mr. Niwa and Mr. Izawa as our most important working group.

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EFFICIENCY OF THE LEAST SQUARES ESTIMATORS IN LINEAR MODELS WITH IDEMPOTENT COVARIANCE MATRIX OF THE ERROR TERMS

Hiroshi Sadamichi

I. Introduction

There are two well-known theorems on the best linear unbiased estimators (BLUE) of linear models—Gauss-Markov theorem and Aitken theorem, which assume that the moment matrix of all the regressors and the covariance matrix of the error terms are both nonsingular. However, discovery of pseudoinverse or generalized inverse of matrices made it possible for Gauss-Markov theorem to be generalized to the case where neither the moment matrix nor the covariance matrix is assumed to be nonsingular. [9]

Under this more general set of assumptions it has been proven that the Aitken estimators or the so-called generalized least squares estimators obtained from replacing the inverse sign with the pseudoinverse sign (we shall call the pseudo Aitken estimators hereafter) are no longer BLUE unless the covariance matrix is nonsingular, and that they are not necessarily more efficient than even the least squares estimators.

In this paper we will show that (1) the least squares estimators are more efficient than the pseudo Aitken estimators in the case of an idempotent covariance matrix and that (2) the Basmann estimators may be interpreted to be the least squares and the pseudo Aitken estimators in such models, which are also the best.

II. The Pseudo Aitken Estimators

Consider a general linear model as follows:

(1) $\qquad y = X\beta + u$

y is a vector of the dependent variable, X is a matrix of the independent exogenous variables, and β is a vector of the parameters. u is a vector of the error terms, which is assumed to have the mean vector and the covariance matrix given by

(2) $\qquad E\,u = 0$

(3) $\qquad E\,uu' = V^2 = W$

It is to be noted here that no assumptions are made on the rank of X and W.

The pseudo Aitken estimators may be defined as

(4) $\tilde{\beta}=(X'W^+X)^+X'W^+y,$

where $+$ indicates the pseudoinverse sign. For any matrix, say M, there exists such a matrix N that satisfies the following four relations and N is called the pseudoinverse of M, denoted by M^+. [1, 6]

      (i) $MNM=M$

      (ii) $NMN=N$

      (iii) $(MN)'=MN$

      (iv) $(NM)'=NM$

It is shown that N is uniquely determined. If M is nonsingular $M^+=M^{-1}$. M^+ may be written as $(M'M)^+M'$ or $M'(MM')^+$.

The pseudo Aitken estimators thus defined are not BLUE in general. When W is nonsingular, the pseudo Aitken estimators

(5) $\hat{\beta}=(X'W^{-1}X)^+X'W^{-1}y$

turn out to be BLUE. [1] But when W is singular the pseudo Aitken estimators are neither BLUE nor are they necessarily more efficient than the least squares estimators.

Now, let us impose two more assumptions:

(6) W is idempotent, and

(7) $X'WX$ is nonsingular, hence $X'X$ is also nonsingular.

It will be shown under these assumptions that the least squares estimators are more efficient than the pseudo Aitken estimators.

Since W is idempotent, $W^+=W$. The pseudo Aitken estimators become

(8) $\tilde{\beta}=(X'W^+X)^+X'W^+y=(X'WX)^{-1}X'Wy.$

The least squares estimators are given by

(9) $\bar{\beta}=(X'X)^{-1}X'y.$

In order to prove that the least squares estimators are more efficient than the pseudo Aitken estimators, it is sufficient to show that the difference between the covariance matrices of both estimators are non-negative definite.

(10) $S=(X'WX)^{-1}-(X'X)^{-1}(X'WX)(X'X)^{-1}$

It may be assumed here without loss of generality that $X'X$ is an identity matrix. If not, there exists a nonsingular matrix T such that $T'X'XT=I$ and the estimators of β are BLUE if and only if those of $T^{-1}\beta$ in the transformed model given by

(11) $y=H(T^{-1}\beta)+u,$

where $H=XT$ and $H'H=I$.

The difference in (10) will be simplified to be

(12) $S=(X'WX)^{-1}-(X'WX)=TD^{-1}T-TDT'=T(D^{-1}-D)T'.$

Since $X'WX$ is symmetric there exists an orthogonal matrix T such that $X'WX=TDT'$, where D is the diagonal matrix whose diagonal elements are the characteristic roots of $X'WX$. Furthermore, all the characteristic roots of $X'WX$ are positive and not

greater than unity. They are positive because $X'WX$ is nonsingular and $X'WX=$ $(WX)'$ (WX), i.e., positive definite. Let us define an idempotent matrix as $(I-W)$. Then $X'(I-W)X$ is non-negative definite and its characteristic roots are all non-negative.

(13) $X'(I-W)X=T(I-D)T'$

In other words, $1-\delta_i \geq 0$, where δ_i is any characteristic root of $X'WX$. Hence $1 \geq \delta_i$. $(D^{-1}-D)$ in (13) is a diagonal matrix and any of its diagonal element is expressed as $\delta_i^{-1}-\delta_i$, which is nonnegative because $1 \geq \delta_i > 0$. Thus, the difference S in (13) in nonnegative definite, which completes the proof.

If W is idempotent and nonsingular, then $W=I$ and therefore the pseudo Aitken estimators collapse into the classical least squares estimators. Even though the least squares estimators are more efficient than the pseudo Aitken estimators if W is idempotent and singular, they are not the best in general. It is to be noted that the best linear unbiased estimator of β is given by the general Gauss-Markov theorem as

(14) $\hat{\beta}=X^+(I-\bar{V}^+V)'y$.

where $\bar{V}=V(I-XX^+)$ and V^2 is an arbitrary covariance matrix of the error terms [7]

Efficiency of the least squares vs. the pseudo Aitken estimators in relation to their underlying assumptions in the model may be summarized in Table 1. Some explanation is in order.

Case 1. The least squares estimators may be well defined as the unbiased estimators given by

(15) $\hat{\beta}=(X'X)^+X'y=X^+y$,

but when none of those assumptions are imposed upon X and W, the pseudo Aitken estimators may not be unbiased.

Case 2. It is interesting to see that one single assumption of nonsingularity of covariance matrix may allow the pseudo Aitken estimators to be the best as well as unbiased.

Table 1. Efficiency of the Least Squares vs. the Pseudo Aitken Estimators

| case | Which are assumed?[1] | | | | Which are more efficient?[2] | |
	$X'X$ nonsingular	W nonsingular	$X'WX$ nonsingular	W idempotent	least squares estimators	pseudo Aitken estimators
1	X	X	X	X	X	XX
2	X	0	X	X	X	00
3	0	0	0	X	X	00
4	0	X	0	0	0	X
5	0	0	0	0	00	00

(1) 0=assumed, X=not assumed

(2) XX=not applicable,
X=less efficient
00=the most efficient,
0=more efficient

Case 3. If X and W are both nonsingular, then it is the case of the Aitken theorem.

Case 4. If in case 3 W is not assumed to be nonsingular but to be idempotent, then the least squares estimators are not necessarily the best but more efficient than the pseudo Aitken estimators.

Case 5. If in case 4 W is also assumed to be nonsingular, then it comes back to the case of the Gauss-Markov theorem. The least squares estimators are identical to the pseudo Aitken estimators and are the best.

The Basmann estimators will present an interesting example of the intermediate case between the cases 4 and 5, where the least squares estimators are identical to the pseudo Aitken estimators and also the best although W is not an identity matrix.

III. An Interpretation of the Basmann Estimators

A structural equation in the simultaneous equation model may be written as

(16) $y = Z\beta + u$,

where y is a vector of the dependent variable, Z is a matrix of the explanatory variables which include some other jointly dependent variables, and β is a vector of the parameters. u is a vector of the error terms, and its mean vector and covariance matrix are given by

(17) $Eu = 0$, $Euu' = I$.

Let X be a matrix of all the exogenous variables in the model and $C = X(X'X)^{-1}X'$. Since Z includes some of the jointly dependent variables, it is correlated with u. Now consider the following transformed equation premultiplied by C.

(18) $Cy = CZ\beta + Cu$

In this transformed equation the explanatory variables CZ are not correlated with the error terms Cu asymptotically. Let us rewrite Z as

(19) $Z = (Y_1, X_1)$,

where Y_1 and X_1 are matrices of the explanatory jointly dependent variables and of the exogenous variables appearing in the equation. Then it is shown that

(20) $\operatorname{plim} (X'X)^{-1}X'Y = \pi_1$,

where π_1 is a matrix of the reduced-form parameters for Y_1. Using this, we obtain

(21) $\lim E(CZ)'Cu = \lim E\, Z'X(X'X)^{-1}X'u$

$$= \lim E \begin{Bmatrix} Y_1'X(X'X)^{-1} \\ X_1'X(X'X)^{-1} \end{Bmatrix} X'u$$

$$= \begin{Bmatrix} \pi_1' \\ \begin{pmatrix} X_1' \\ 0 \end{pmatrix} \end{Bmatrix} \lim EX'u = 0$$

The mean vector and the covariance matrix of the error terms are given as

(22) $ECu = 0,\ E(Cu)(Cu)' = C$

We will notice here that in the transformed equation the covariance matrix of the error terms is idempotent and singular.

The Basmann estimators $\tilde{\beta}$ in (16) are given as follows. [2]

(23) $\qquad \tilde{\beta}=(Z'CZ)^{-1}Z'Cy=(CZ)^+y=(CZ)^+Cy.$

It is clear from (15) that the Basmann estimators are identical to the least squares estimators in the transformed equation (18).

The pseudo Aitken estimators in (18) may be expressed as

(24) $\qquad \tilde{\tilde{\beta}}=[(CZ)'C^+(CZ)]^+(CZ)'C^+y$

$\qquad\qquad =(Z'C'C^+CZ)^+Z'C'C^+y$

$\qquad\qquad =(Z'CZ)^{-1}Z'Cy$

$\qquad\qquad =\tilde{\beta}.$

It follows that the least squares and the pseudo Aitken estimators in (18) are not only identical but also the same as the Basmann estimators. It will be also shown that they are the best linear unbiased estimators in such a sense that they are unbiased in the limit. To the extent that CZ is approximately independent of Cu in finite samples, the best linear unbiased estimators in (18) are given by the general Gauss-Markov theorem as

(25) $\qquad \hat{\beta}=(CZ)^+(I-\bar{V}^+C)'Cy,$

where $\bar{V}=C[I-(CZ)(CZ)^+]=C-(CZ)(CZ)^+$. Since $\bar{V}$ proves to be idempotent $\bar{V}^+=\bar{V}$. Substituting into (25) and using the definitional relations of pseudoinverse, we obtain

(26) $\qquad \hat{\beta}=(CZ)^+[I-\{C-(CZ)(CZ)^+\}C]'Cy$

$\qquad\qquad =(CZ)^+\{I-C+(CZ)(CZ)^+\}Cy$

$\qquad\qquad =(CZ)^+\{C-C+(CZ)(CZ)^+C\}y$

$\qquad\qquad =(CZ)^+(CZ)(CZ)^+Cy$

$\qquad\qquad =(CZ)^+Cy$

$\qquad\qquad =\tilde{\beta}.$

Thus, the Basemann estimators have turned out to be the best linear unbiased estimators in (18) in the sense mentioned above.

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DIVERSIFICATION OF LARGE JAPANESE MANUFACTURING FIRMS

Hideki YOSHIHARA

1. Introduction

Purpose of the Paper

The purpose of this paper is to present some findings of our research[1] on diversification strategy of large Japanese manufacturing firms, and to attempt comparisons with the case of American firms.

Research Design

The aim of our research is (1) to identify the actual state of diversification strategy of large Japanese manufacturing firms, and (2) to investigate the causes of diversification, the economic performance of diversification, and the relationship between diversification strategy and organizational structure.

The sample is the largest 118 manufacturing firms in Japan. The period covered by our research is from 1958 to 1973. This period roughly corresponds to the period of high economic growth in postwar Japan.

Using Rumelt's (1974)[2] method (slightly modified), each firm's strategy was identified for 1958, 63, 68 and 73. We also computed the Herfindahl indices of diversification for each of these years. Each firm's organizational structure was identified for 1963, 68 and 73. The data sources for strategy classification are the company annual reports and the special survey conducted by Japan Economic Data Development Center. The data for organization classification are provided by Management Research Institute, Japan Productivity Center and Kansai Productivity Center.

2. Findings of Japanese Diversification and Comparison with American Diversification

Strategy Pattern

The composition of strategy types of Japanese and American firms is shown in Table 1. As for Japanese firms, an overall strategic trend is toward diversification as is represented by the decrease of S type (26.3%→16.9%) and the increase of RL type

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1) The other co-researchers are Hiroyuki Itami, Akimitsu Sakuma and Tadao Kagono. The findings of our research are presented in more detail, in Yoshihara, Sakuma, Itami, and Kagono, *Diversification Strategy of Japanese Firms*, Nippon-Keizai-Shinbunsha, 1981 (in Japanese).

2) R. P. Rumelt, *Strategy, Structure and Economic Performance*, 1974.

(15.8%→25.4%). But, it needs to be noticed that V type steadily increased in this fifteen year period.

Let us compare with American firms. In the United States, the proportion of diversified firms increased 28.3 percent (49.9%→78.2%) in twenty years and in 1969 far surpassed the proportion of non-diversified firms of S and V types. In Japan, diversified firms increased only 3.9 percent (60.5%→64.4%) in fifteen years. Thus, compared with American firms, Japanese firms were much slower in their diversification moves, and far behind in the attained level of diversification. The difference of tempo in diversification moves of Japanese and American firms is clearly represented in Figure 1, which graphicly presents the data of Table 1.

The direction of strategic moves of Japanese and American firms is shown in

Figure 1. Comparison between Japanese and American Diversification
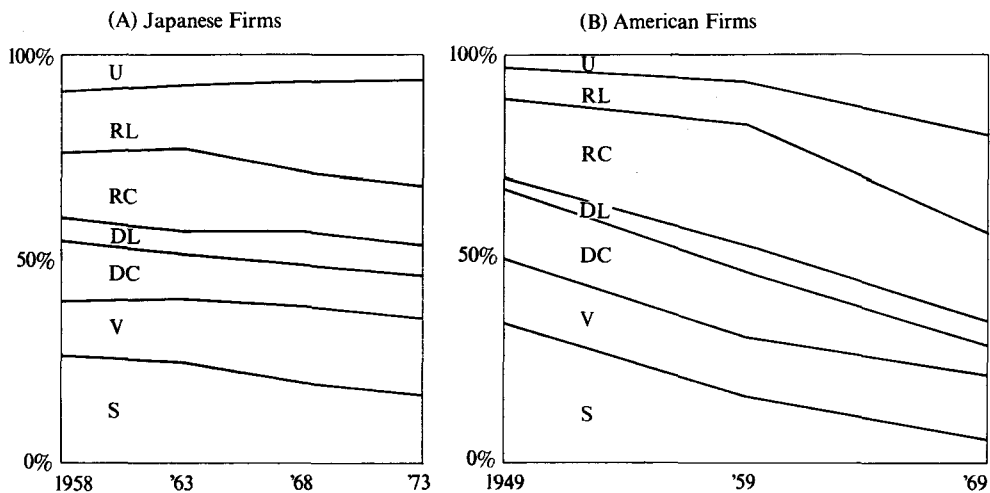
Notes: This figure is based on the data of Table 1.

Table 1. Strategy Composition

Strategy Type \ Year	1958 # of firms (percentage)	1963	1968	1973	U.S.A. (1949)	U.S.A. (1959)	U.S.A. (1969)
S	30 (26.3%)	29 (24.6%)	23 (19.5%)	20 (16.9%)	34.5%	16.2%	6.2%
V	15 (13.2)	18 (15.3)	22 (18.6)	22 (18.6)	15.7	14.8	15.6
DC	17 (14.9)	13 (11.0)	12 (10.2)	13 (11.0)	18.0	16.0	7.1
DL	7 (6.1)	7 (5.9)	10 (8.5)	8 (6.8)	1.8	6.4	6.5
RC	17 (14.9)	23 (19.5)	17 (14.4)	17 (14.4)	18.8	29.1	21.6
RL	18 (15.8)	19 (16.1)	26 (22.0)	30 (25.4)	7.9	10.9	23.6
U	10 (8.8)	9 (7.6)	8 (6.8)	8 (6.8)	3.4	6.5	19.4
Total	114 (100.0)	118 (100.0)	118 (100.0)	118 (100.0)	100.0	100.0	100.0

Notes: To compare with Japanese data, Rumelt's DLU is combined into DL, and DV is shown as V.

Table 2. Compared with American firms, the strategic moves of Japanese firms are characterized as (1) more active in vertical move and concentration move, and (2) less active in diversification move. This feature of Japanese strategic moves is more evident in the data of Table 3, in which the CL-classification is used. According to this classification, among the strategic changes involving DC, DL, RC, and RL, only the changes which involve changes in C and L (DC→DL or RC→RL) are identified as the diversification move. Thus, this classification is a more severe standard in identifying diversification move. As it is shown in Table 3, in the ten year period of 1958–68, the vertical move and the concentration move of Japanese firms amount to 13.2 percent, and surpass the diversification move (12.3%). On the other hand, in the case of American firms of the ten year period of 1959–69, the strategic changes were mostly the diversification move, and the vertical move and the concentration move were only small percent (3.5% and 0.4%).

To sum up, the diversification moves of Japanese firms were less active than American firms. It is our reasoning that this relative inactiveness in diversification of Japanese firms was a rational response to higher growth rate of Japanese economy. Japanese firms were able to grow within their existing business fields. It is our estimation that full-scale diversification moves of Japanese firms are now under way

Table 2. Direction of Strategic Moves

period moves	Japan		U.S.A.	
	1958–68	1963–73	1949–59	1959–69
No move	64.1%	71.2%	73.7%	62.6%
Vertical move	8.8	5.1	2.1	3.5
Concentration move	9.6	5.9	0.7	2.7
Diversification move	17.5	17.8	23.5	31.2

Notes:
Vertical move: move to V
Concentration move: move to a less diversified type
Diversification move: move to a more diversified type

Table 3. Direction of Strategic Moves (CL—classification)

period moves	Japan		U.S.A.	
	1958–68	1963–73	1949–59	1959–69
No Move	74.5%	80.5%	74.1%	65.8%
Vertical Move	8.8	5.1	2.1	3.5
Concentration Move	4.4	2.5	0.7	0.4
Diversification Move	12.3	11.9	23.1	30.3

Notes:
CL—classification: V, S, C, L, U
C=DC+RC
L=DL+RL

as the growth rate of Japanese economy has substantially slowed down since the
oil crisis in 1973.

Causes of Diversification

In investigating causes of diversification of Japanese firms, the following eight
variables were examined in our analysis: (1) industry growth, (2) concentration of
industry, (3) change of concentration of industry, (4) size of firms, (5) financial
resources of firms, (6) research and development expenses of firms, (7) advertising
expenses of firms, (8) performance gap of firms.

Our quantitative analysis tells us that the diversification moves are significantly
related with the following three variables: (1) slowdown of growth rate of industry,
(2) negative profitability gap, and (3) high density of research and development
expenses. The first two variables represent the necessity of diversification, and the
third variable represents the resources for diversification.

Comparison with American firms is not possible since the causes of diversi-
fication are not treated in Rumelt's study.

Economic Performance of Diversification

Firstly, let us compare economic performance of Japanese and American diversi-
fication. As for profitability (ROC or ROE in Table 4), Japanese and American
firms share similarity. Profitability is high at DC and RC, and low at V and U. The
pattern is convex both for Japanese and American firms. But, growth performance
(GSL or GER) significantly differs between Japanese and American firms. As for
American firms, growth performance is also good at DC and RC, and poor at V and
U. Thus, in the case of American firms DC and RC are best performers of both
profitability and growth, and V and U are worst performers of these two measures.
As for Japanese firms, DC is not so good in growth performance. Low diversification
strategy types of V, S, and DC are relatively poor in growth performance, and high
diversification strategy types of RC, RL and U are relatively good in growth per-
formance. Thus, in the case of Japanese firms, degree of diversification seems to be
linearly related with growth performance (This relationship is to be treated later in
this paper.) To Japanese firms the diversification strategy simply was a growth
strategy.

Next, let us control non-strategy variables and examine net effect of diversi-
fication strategy on economic performance. The result of regression analysis is
presented in Table 5. Profitability performance is high at DC and DL, and low at
V, RL, and U. The Pattern of strategy effect on profitability is convex. The convex
shape of profitability performance is identified in our different analyses using
Herfindahl diversification indices and metric strategy variables, and pair-wise com-
parison by ANOVA.

Table 4. Comparison of Japanese and American Performances
(Data in deviations from the overall mean)

Performance / Strategy	ROC		ROE		GSL		GER	
	Japan	U.S.A.	Japan	U.S.A.	Japan	U.S.A.	Japan	U.S.A.
V	−2.24	−2.28	−1.79	−2.46	−1.76	−1.59	−0.25	−1.38
S	0.57	0.29	1.08	0.56	−0.99	−1.84	−5.14	−3.91
DC	4.28	2.19	1.50	2.27	−1.36	0.47	−0.01	0.36
DL	−0.88	−1.83	1.49	−2.36	0.87	−2.08	−1.56	−0.62
RC	2.67	1.45	1.77	1.47	2.55	0.61	3.18	1.67
RL	−1.14	−0.09	−0.89	−0.36	1.25	−0.95	3.05	−1.57
U	−2.26	−1.12	−1.67	−2.26	0.14	−2.91	1.17	−0.94
Overall mean	13.13	10.52	10.78	12.64	14.59	9.01	11.56	8.72
Significance level of F-test	0.03	0.001	0.1	0.005	0.02	0.05	0.01	0.1
Correlation between two	0.92[a]		0.65[c]		0.24		0.71[b]	

Notes:

1. Performance: ROE and GSL are defined similarly for both Japan and USA. Definitions of ROC and GER for U.S.A. are on an after-interest and after-tax basis. Risk measures are not comparable and omitted.
2. Strategy: Since there is no conglemereate in Japan, its category is omitted here for USA. Sample firms are those which remains in each strategy category for the period, for both countries.
3. Period and Sample: 1963–73, 112 firms (6 firms were excluded due to data problems)
4. Definition of performance variables:
    ROC: Return on investment, (net income before interests and tax)/(Total Capital—Non-interest-bearing current liabilities), 10 year average
    ROE: Return on equity, (net income after tax)/(net worth), 10 year average
    GSL: Growth of Sales, measured by a time-series log-linear regression for 63–73
    GER: Growth of Operating Earnings, measured similary as GSL

The pattern of growth performance is rather different. The good performers are high diversification strategies of RL and U, and poor performers are low diversification strategies of V and S. Thus, growth performance seems to be linearly related with the degree of diversification. This linear relationship is nearly identified in our analyses[3].

Our findings of strategy effect on economic performance may well be summarized in Figure 2. Strategies of low diversification are worst both in profitability and growth. Strategies of medium diversification are better in profitability than strategies of high diversification, and vice versa in growth performance. Thus, a kind of trade-off relationship exists between profitability and growth.

Comparison with American firms is not possible since Rumelt does not examine net effect of strategy on economic performance.

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3) See pp. 149–152 of our Japanese book.

Strategy and Structure

There were twenty S type companies in 1973 and ninety percent of these non-diversified companies adopted functional structures (Table 6). On the other hand,

Table 5. Regressions with Strategy Dummy
(t-values in parenthesis)

Performance Variables	ROC	ROE	GSL	GER
Constant	−9.085	−13.393	−4.443	−12.631
X_G	0.195 (1.38)	0.274[b] (2.34)	0.560[a] (4.99)	0.642[a] (2.93)
X_S	1.308[b] (2.56)	1.425[a] (3.36)	0.722[c] (1.77)	1.523[c] (1.92)
X_C	0.019 (0.98)	0.023 (1.43)	0.227 (1.51)	−0.053[c] (1.79)
X_R	0.068 (0.14)	0.813[b] (2.11)	0.060 (0.16)	1.007 (1.40)
X_A	1.373[a] (6.58)	0.499[a] (2.88)	−0.138 (0.83)	−0.380 (1.17)
Y_S	0.970 (0.74)	1.586 (1.46)	0.030 (0.00)	−5.516[a] (2.71)
Y_{DC}	3.549[b] (2.28)	2.985[b] (2.30)	0.544 (0.44)	2.903 (1.20)
Y_{DL}	2.045 (1.17)	2.444[c] (1.68)	1.074 (0.77)	−0.358 (0.13)
Y_{RC}	1.216 (0.82)	−0.033 (0.03)	0.320 (0.27)	−1.857 (0.80)
Y_{RL}	−0.044 (0.03)	0.115 (0.12)	1.655[c] (1.79)	2.020 (1.12)
Y_U	−0.113 (0.07)	−0.100 (0.07)	1.310 (1.00)	1.386 (0.54)
$\bar{R}^2$	0.406	0.288	0.265	0.206

Notes:
1. For performance variables, see notes of Table 4.
2. Period and sample: 1963–73, 112 firms
3. Control Variables for environmental and other factors
    X_G: Industry growth, defined as the weighted average of the growth rates of the shipments of each 3-digit industry in which the firms has sales. Weights are the firm's sales composition percentages.
    X_S: Size of the firm's sales (natural logarithm is taken) in 1968.
    X_C: 3-firm concentration ratio of the firm's principal industry in 1968.
    X_R: Average ratio of research and development expenses over sales for 1968–73. (Data availability limited the period of calculation)
    X_A: Average ratio of advertizing expenses over sales for 1963–73.
    Z_S: Science industry dummy, 1 for a science industry firm, 0 for a non-science industry firm.
    Z_C: Consumer industry dummy, 1 for a consumer industry firm.
4. Strategy Variables
    Y_i (i=S, DC, DL, RC, RL, U): Dummy variables for strategy type in 1973. All Y_i's are zero for V firms.

Figure 2. Diversification Effect on Profitability and Growth
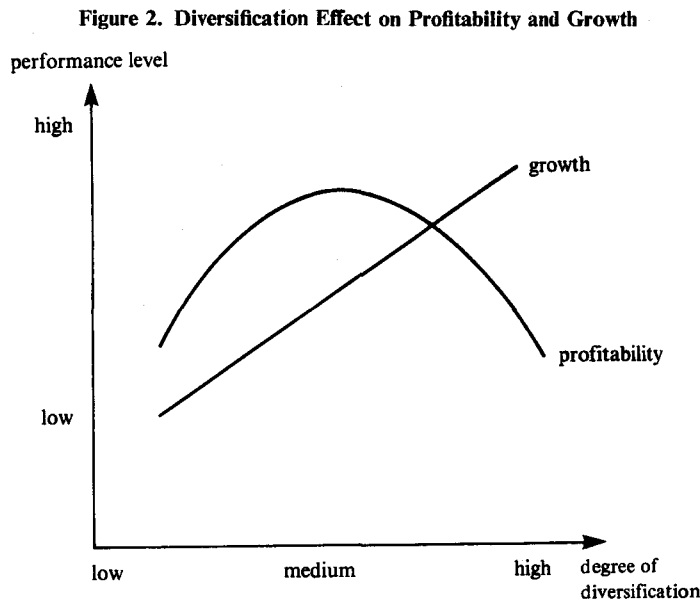
Table 6. Relationship between Strategy and Organization

Organization Strategy	Functional	Functional-with subsidiaries	Divisional
S	18 (90.0%)	0 (0.0)	2 (10.0)
V	8 (36.4)	9 (40.9)	5 (22.7)
DC	6 (46.2)	3 (23.1)	4 (30.8)
DL	3 (37.5)	2 (25.0)	3 (37.5)
RC	7 (41.2)	3 (17.6)	7 (41.2)
RL	5 (16.7)	3 (10.0)	22 (73.3)
U	1 (12.5)	1 (12.5)	6 (75.0)
Total ($ of firms)	48	21	49

Notes: Strategy and organization are as of 1973.

nearly three fourths of twenty-eight highly-diversified companies (RL and U) had divisionalized structures. For the companies of medium degree of diversification and V type companies, organizational structures were rather evenly distributed among three types of organization.

Next, let us examine the relationship between strategy and structure using the Herfindahl indices of diversification. As it is shown in Table 7, the Herfindahl indices are lowest for the firms having functional structures, and highest for the companies of divisionalized structures. And the indices of the companies having the structure of functional-with-subsidiaries fall between these two cases.

The above examination tells us that degree of diversification runs parallel with degree of adoption of divisionalized structures. Thus, it may well be said that

Table 7. Herfindahl Index of Diversification of Organization Types

Organization / Year	1963	1968	1973
Functional	26.6	23.3	24.8
Functional-with-subsidiaries	38.7	41.5	41.0
Divisional	57.6	57.1	56.7
Overall mean	37.5	38.4	40.5
F-ratio	16.856[a]	36.084[a]	31.191[a]

Notes:

1. Herfindahl Index of Diversification (DI) is $(1 - \sqrt{\sum_{i=1}^{n} P^2 i}) \times 100$, where Pi represents the ith business of each firm identified by the three-digit standard commodity classification.
2. a: significant at 1 % level

structure followed strategy in Japanese firms, too.

Let us compare Japanese structures with American structures. While more than three fourths of American firms had divisionalized structures in 1973, only one third of Japanese firms adopted divisionalized structures. In ten years from 1959 to 1969 the proportion of American firms with divisionalized structures increased nearly thirty percent (49.7%→77.0%). On the other hand, the proportion increased only thirteen percent (28.8%→41.5%) in the case of Japanese firms from 1963 to 1973. Thus, the speed of adoption of divisionalized structures by Japanese firms was much slower than American firms, and the attained proportion of this organizational structure was much less in Japanese firms. And it is our reasoning that this slower spread of divisionalized structures among Japanese firms was a rational response to their strategic behavior. As it was already mentioned in this paper, diversification moves of Japanese firms were less speedy than American firms.

Finally, let us investigate organization effect on economic performance. Is fitness between strategy and structure related with better economic performance? The result of regression analysis shown in Table 8 tells us that fitness between strategy and structure is not necessarily related with better economic performance. The regression coefficients of the variables of OC (Over-Centralization) and OD (Over-Decentralization) are mixed with the positive and negative signs, and most of their t values are below the significance level.

The result presented in Table 8, however, suggests an interesting fact. As for the profitability performance (ROC and ROE), the variable OC has larger coefficients than the variable OD, and vice versa for the growth performance (GSL and GER). It is our hypothesis that overcentralized organization has a positive effect on profitability, and that over-decentralized organization is good to improve growth performance.

Table 8. Organization Fitness and Economic Performance
—Regression Analysis—

Performance Variables	A		B	
	ROC	GSL	ROC	GSL
Constant	−14.203	−5.199	−7.597	−5.340
X_G	0.252c	0.568a	0.199	0.581a
X_S	1.569a	0.771c	1.097b	0.715c
X_C	0.026	0.022	0.028	0.028c
X_R	−0.092	0.051	−0.044	0.011
X_A	1.522a	−0.131	1.449a	−0.095
Y_S	1.243	0.075	1.130	0.184
Y_{DC}	3.359b	0.720	3.355b	0.075
Y_{DL}	1.381	1.208	2.813	1.101
Y_{RC}	0.944	0.242	2.254	0.465
Y_{RL}	0.028	1.663c	0.690	1.983b
Y_U	0.435	1.332	0.535	1.587
OC	2.048c	−0.188	2.076	1.728
OD	1.302	0.567	−1.057	0.292
$\bar{R}^2$	0.418	0.255	0.484	0.353

Notes:
1. OC: Over-Centralization
   OD: Over-Decentralization
2. Organization fitness with strategy is identified in the two ways. In Panel A, discrimimant analysis is used, where dependent variables are organization types and independent variables are (1) DI, (2) X_S, (3) X_C, (4) X_R, (5) X_A and (6) X_G. In Panel B, an a priori judgement is used as follows.

Organization Strategy	F	F+S	D
S		OD	OD
V			OD
DC	OC		OD
DL	OC	OC	
RC	OC	OC	
RL	OC	OC	
U	OC	OC	

OC: Over-Centralization
OD: Over-Decentralization

3. Significance level
   a: 1%, b: 5%, c: 10%

We are not in a position to compare with American cases since organization effect on economic performance is not treated in Rumelt's study.

3. Conclusion

Overview of Findings

Basic findings of our research may be summarized in Figure 3.

Figure 3. Overview of Findings on Japanese Diversification
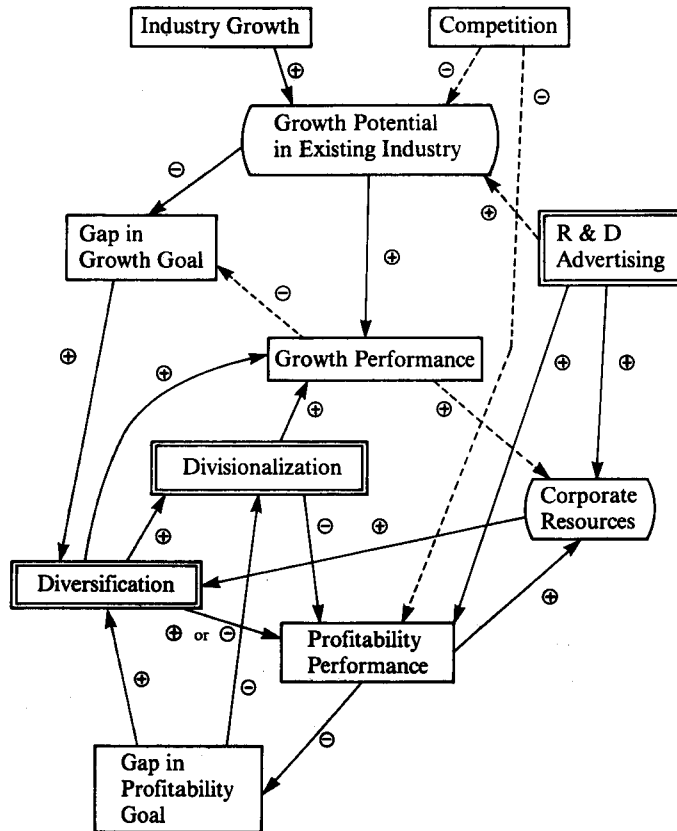
Notes:

▭ : decision variables of management

▭ and ▭ : variables directly treated in our analysis

( ) : variables not directly treated in our analysis

⟶ : relationship directly or indirectly identified in our analysis

·····➤ : hypothetical relationship not identified in our analysis

⊕, ⊖ : relationship is positive (+) or negative (−)

Three variables are identified as the causes of diversification. The first one is slowdown of growth of industry. This is indicated in Figure 3 by the line with arrow from 'industry growth' via 'growth potential in existing industry' via 'gap in growth goal' to 'diversification'. The second cause is the high density of R & D expenses. This is indicated by the line with arrow from 'R & D and advertising' via 'corporate resources' to 'diversification'. The last cause of negative gap in profitability is shown in Figure 3 by the line with arrow from 'gap in profitability goal' to 'diversification'.

The findings of the strategy effect on economic performance and of the relationship between strategy and structure are represented in a similar manner in Figure 3.

Thus, this figure represents an overall view of the findings of our research on the diversification of Japanese firms.

Zigzag Model of Strategic Behavior

As mentioned earlier, a kind of trade-off relationship exists between diversification and economic performance (see Figure 2). High diversification strategy is optimum for growth performance, but behind medium diversification strategy with respect to profitability. On the other hand, the medium diversification strategy which is best for profitability sacrifices growth performance to some extent. This trade-off relationship suggests an interesting hypothesis concerning strategic behavior. When the first priority is given to growth rather than to profitability, then firms would pursue stretched-diversification (relative to their resources and environmental conditions). On the other hand, in situations where profitability is given the first priority, restrained-diversification would be pursued. Firms pursue either stretched-diversification or restrained-diversification depending upon the goal priority. And firms might attain a long-term prosperity by carefully switching between these two modes of diversification. In short, a zigzag mode of diversification might be optimum in the long run.

A similar argument may be applicable to organizational response to diversification strategy. As mentioned earlier, over-centralization surpasses over-decentralization for profitability, and vice versa for growth. It might be that firm's organizational response is also zigzag in the long run.

Thus, our findings suggest a zigazag model of strategic behavior.

INDEXING POLICIES AND MACROECONOMIC STABILITY IN BRAZIL: RATIONAL EXPECTATION MODEL

Shoji NISHIJIMA

1. Introduction

Indexing policies have played an important role as a macroeconomic stabilization policy in many countries and it is well-known, Brazil is the typical country where such policies have been widely adapted in various areas since the 1960s. Even in Brazil, however, there has been no common understandings as to their effectiveness on stabilization. Particularly after the First Oil Crisis, Brazil has experienced substantial instabilities of inflation and growth rates in spite of the existences of almost complete indexing policies regarding to exchange rate, wage adjustment, interest rates, etc. In order to understand the roles of indexing policies, this paper develops a stochastic macro model that analyzes their effects on price and output variance. The second purpose of the paper is the empirical study of the Brazilian economy, in which we test the "random walk" hypothesis derived from the model.

The model treats three accommodating policy rules: the money supply rule, the exchange rate rule and the wage adjustment rule. "Accommodation" implies that the authorities set nominal variables according to changes of prices. In the case of full accommodation, these variables are held constant in real term. An accommodating policy, in general, can eliminate relative-price changes and work to diminish variances in real side. However, when we consider explicitly the stickiness of wage adjustment which is caused by the lagged wage indexing rule and/or the imported intermediate goods which affect both the demand and supply side, we have to correct the general story. From the experiences of the Brazilian economy, in which there have been an explicit lagged wage indexing rule and serious impacts of oil crises, we intend to reflect these two points in the model.

Taylor [6] has developed a macromodel of sticky wage adjustment in the sense of long-term overlapping contracts (not in the sense of lagged wage indexing rule), where disturbances have effects on the stability of output and price. Dornbusch [4], [5] demonstrated, in the extended Taylor model, that the PPP exchange rate rule affects the output-price stability trade-off through two channels. The PPP rule tends to maintain the real exchange rate constant, therefore stabilizing demand. On the other hand, devaluation of the exchange rate by the PPP rule affects costs and prices through the domestic currency costs of imported intermediate goods. When

there is a wage disturbance, its impact on prices will be enforced by this second channel.

This paper presents an extension of these models, including three accommodating policy rules of money supply, exchange rate and wage adjustment rate. These rules are specified that the authorities execute them using their expected price and inflation rate for the present period, under a rational expectation formulation. An another extension is the explicit introduction of the Lucas type supply function and the wage indexing rule. In such a model setting, we investigate the role of the accommodating policy rules to stabilize price and output, focusing on the effects of stochastic variables on the variances of price and output. Finally we test the "random walk" hypothesis of prices applied to the Brazilian economy. In the case of full accommodation, the model demonstrates that the deviations of prices from their long run trend follow a "random walk". Using inflation rates as a proxy, Brazilian case was most significantly estimated.

2. The Model

The model is composed of two basic equations; the aggregate demand function and the aggregate supply function. The former is derived from the standard IS-LM model and the latter is based on the Lucas type supply function. The policy rules are specified that, under the assumption of the rational expectation formulation of the authorities, the money supply and exchange rate are adjusted according to expected price levels and the wage adjustment rate is determined by expected rates of inflation. In this setting, we analyze the policy rules as stabilization policy, mainly from the point of their impact on convergence speeds of the system and on variances of price and output.

We now begin with the demand side. The aggregate demand function is derived from the equilibrium condition of goods and money markets through the equilibrium interest rate, expressing the relation between the planned demand for goods and the price level. The equilibrium conditions for the two markets are given respectively:

$$m/p = f(y, i)$$
$$y = h(y, i, e/p, \bar{g}),$$

where, the notations are as follows; m: nominal money stock, p: price level, y: real output, i: nominal interest rate, e: nominal domestic currency price of exchange rate, $\bar{g}$: fiscal expenditure, and all variables are dated at period t, but without attached "t", throughout the paper.

Assuming the usual sign of the partial differencials of these equations from the standard IS-LM model, we obtain the following equation expressed in logs (from now on all variables are in logs):

$$y=a(m-p)+b(e-p)+c\bar{g}$$
$$a,\ b,\ c>0.$$

The aggregate demand depends on real money stock, real exchange rate and real fiscal expenditure. A rise in the real money stock reduces the interest rate and rises the investment demand. A real depreciation of the currency causes shifts in demand from foreign goods to domestic goods so far as satisfies the Marshall-Lerner condition. Real fiscal expenditure is assumed to be determined exogenously, independent of the policy rules mentioned in this paper.

The authorities determine nominal money stock and nominal exchange rate of period t according to the rules specified as:

$$m=\alpha p^*, \qquad 0\leqq\alpha\leqq1$$
$$e=\beta p^*, \qquad 0\leqq\beta\leqq1.$$

Where, p^* denotes expected price level for period t formulated by the authorities at the end of last period $t-1$. The coefficient α and β measure the extent to which these rules are accommodating. Unit value ($\alpha=1$, $\beta=1$) implies the case of full accommodation, in which real money stock and real exchange rate are held constant, maintaining real demand stable. The case of $\beta=1$ implies the PPP rule. Substituting these rules into the demand equation, turns out the equation:

$$y=-(a+b)p+(a\alpha+b\beta)p^*+c\bar{g}+\varepsilon. \tag{1}$$

Where, ε denotes random variable, assumed white noise: $E(\varepsilon)=0$, $E(\varepsilon\varepsilon_{t-k})=0$, $E(\varepsilon^2)=\sigma_\varepsilon^2$. In the context of the Brazilian economy, ε represents unanticipated disturbances deviated from the policy rules: stochastic changes in money supply caused, for example, by unanticipated inflow and outflow of foreign reserves and irregular devaluations of exchange rate called "maxidesvalorização". Needless to say, could be included unanticipated changes of exports and fiscal expenditure.

Figure 1 might help us to understand the implications of equation (1). Let's assume, for the convenience, that the difference between the expected price p^* and

Figure 1
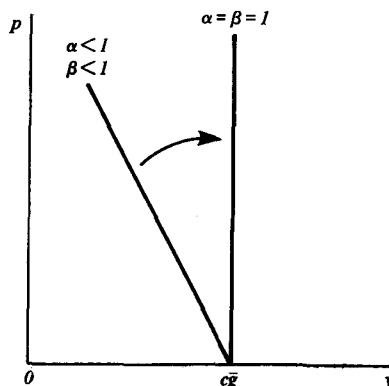
the realized price p is only random variables (this occurs under the assumption of rational expectation, as we see later). Figure 1 depicts the demand curve omitting random variables:

$$y = -\theta p + c\bar{g}$$
$$\text{where, } \theta = a(1-\alpha) + b(1-\beta).$$

If α and β are less than unity $(0 < \alpha < 1, 0 < \beta < 1)$, the demand curve is downward-sloping to the right with the intercept $c\bar{g}$. A rise in price lowers real balance and appreciates real exchange rate, inducing a rise in interest rate and a shift in demand from domestic goods to foreign goods, that is, a fall in demand and output. On the other hand, in the case of full accommodation $(\alpha = \beta = 1$, then θ becomes zero), the demand curve stands vertically, where demand is held constant indifferent of price. Therefore, the more accommodative are the rules, the more becomes demand insensitive to price changes.

We now turn to the supply side. Supply prices are determined by wage costs and the costs of imported intermediate goods through the mark-up principle. With the terms of cost share $(\phi, 1-\phi)$, the price equation is written in growth rates:

$$p - p_{-1} = \phi(w - w_{-1}) + (1-\phi)(e - e_{-1}), \quad 0 \leq \phi \leq 1, \tag{2}$$

where, w denotes nominal wage rate. The domestic price of intermediate goods is given at their exchange rate, because we assume that the foreign price of these goods is unity. Substituting the exchange rate rule into the price equation, we get:

$$p - p_{-1} = \phi(w - w_{-1}) + (1-\phi)\beta(p^* - p_{-1}^*). \tag{3}$$

Notice that the expected price of period $t-1(p_{-1}^*)$ is formulated at the end of period $t-2$, so p_{-1}^* is a known variable at the end of period $t-1$.

Suppose that the wage adjustment rate is determined by both the wage indexing rule and the market condition. The wage indexing rule is specified so that the authorities determine the wage adjustment rate according to the rationally expected inflation rate for period t formulated by themselves at the end of period $t-1$. The market condition follows the so-called Okun law. Combining these adjustments, we specify the inflation rate of wage as follows:

$$w - w_{-1} = \gamma(p^* - p_{-1}) + \varphi(y - \bar{y}), \quad 0 \leq \gamma \leq 1, 0 \leq \varphi,$$

where, $\bar{y}$ denotes the normal output level and γ measures the extent to which the wage rule is accommodating.

Substituting the wage adjustment equation into equation (3), we get the aggregate supply function with a random variable:

$$p - p_{-1} = [\phi\gamma + (1-\phi)\beta](p^* - p_{-1}) + \phi\varphi(y - \bar{y})$$
$$+ (1-\phi)\beta(p_{-1} - p_{-1}^*) + u, \tag{4}$$

The random variable represents supply shocks such as unanticipated wage disturbances deviated from the wage rule, changes of the foreign currency price of imported intermediate goods and climate conditions, etc. We assume white noise
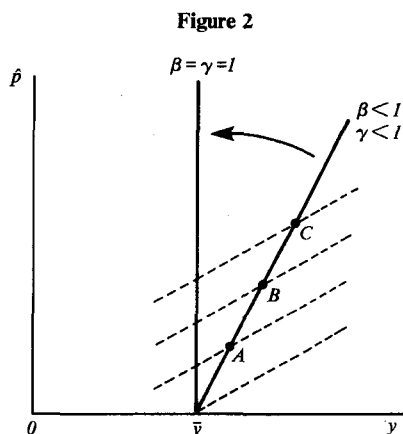
Figure 2

process and the absence of correlation among the random variables.

Figure 2 reveals the implications of equation (4). As well as in the case of the demand curve, we assume that the difference between p_{-1} and p_{-1}^* is only random variables to simplify the matter. Then, we obtain the following equation:

$$p-p_{-1}=[\phi\gamma+(1-\phi)\beta](p^*-p_{-1})+\phi\varphi(y-\bar{y}).$$

This supply curve is depicted in **Figure 2**, where the random variable u is omitted. The dotted line shows the short-run supply curves which have different expected inflation rates and the straight line shows the long-run supply curves with the different extent of accommodation of the exchange rate rule and the wage rate rule. If the parameters β and γ are less than unity, the coefficient of $\hat{p}^*(\equiv p^*-p_{-1})$ is also less than unity. Therefore, the long-run supply curve which is defined by $\hat{p}=\hat{p}^*$, should pass through the points A, B and C along the upward-sloping line to the right. In other words, so far as $\beta<1$ and $\gamma<1$, a rise in price reduces real wage and real costs of imported goods, inducing a rise in output. On the other hand, if the two rules are fully accommodated ($\beta=1$ and $\gamma=1$), the long-run supply curve turns to a vertical one. In this case, the world of the natural rate hypothesis appears and the supply curve becomes identical to the Lucas type. It is apparent that the more the rules are accommodative, the less the change of output is responsive to the change of price.

3. Rational Expectations

So far, we assumed that the authorities execute the policy rules in accordance with their expected price and inflation rate. Now, we assume the rational expectation formulation where the authorities have total current available informations about the macroeconomic structure, and their own expected price is equal to the mathematical means of price. That is:

$$E(p)=p^*. \tag{5}$$

From equation (1) and (4), we derive the reduced form of the price equation:

$$[1+(a+b)\phi\varphi]p=(1-\phi\gamma)p_{-1}-(1-\phi)\beta p_{-1}{}^*+[\phi\gamma+(1-\phi)\beta+\phi\varphi(a\alpha+b\beta)]p^*$$
$$+\phi\varphi(c\bar{g}-\bar{y})+\phi\varphi\varepsilon+u.$$

Getting the conditional means of both sides of the equation, given the total informations available to the authorities at period $t-1$, we obtain the rationally expected price of period t:

$$E(p)=\delta_1 p_{-1}-\delta_2 p_{-1}{}^*+\delta_3(c\bar{g}-\bar{y})$$

where, $\delta_1=(1-\phi\gamma)/[1-\phi\gamma-(1-\phi)\beta+\phi\varphi\theta]$

$\delta_2=(1-\phi)\beta/[1-\phi\gamma-(1-\phi)\beta+\phi\varphi\theta]$

$\delta_3=\phi\varphi/[1-\phi\gamma-(1-\phi)\beta+\phi\varphi\theta]$

$\theta=a(1-\alpha)+b(1-\beta).$

Then, the realized price of period t is given by substituting $E(p)$ into the reduced form equation:

$$p=\delta_1 p_{-1}-\delta_2 p_{-1}{}^*+\delta_3(c\bar{g}-\bar{y})+[\phi\varphi/\tau]\varepsilon+[1/\tau]u \qquad (6)$$

where, $\tau=1+(a+b)\phi\varphi.$

Comparing p and $E(p)$, therefore, it proves that the realized price is equal to the rationally expected price and the random variables:

$$p=E(p)+[\phi\varphi/\tau]\varepsilon+[1/\tau]u. \qquad (7)$$

For the analysis of the long-run equilibrium in the next section, we get the difference equation of realized price by using the following relations. As long as we assume the rational expectation, the relations in equation (5) and (7) are also satisfied at period $t-1$:

$$E(p_{-1})=p_{-1}{}^*$$
$$p_{-1}=E(p_{-1})+[\phi\varphi/\tau]\varepsilon_{-1}+[1/\tau]u_{-1}.$$

From these equations, it is apparent that the difference between the realized price in period $t-1$ and the expected price for period $t-1$ is only random noise:

$$p_{-1}=p_{-1}{}^*+[\phi\varphi/\tau]\varepsilon_{-1}+[1/\tau]u_{-1}.$$

Substituting the above relation into equation (6), finally we get the difference equation of the realized price:

$$p=\delta_4 p_{-1}+\delta_3(c\bar{g}-\bar{y})+[\phi\varphi/\tau]\varepsilon+[\delta_2\phi\varphi/\tau]\varepsilon_{-1}+[1/\tau]u+[\delta_2/\tau]u_{-1}$$

where, $\delta_4=[1-\phi\gamma-(1-\phi)\beta]/[1-\phi\gamma-(1-\phi)\beta+\phi\varphi\theta].$ \qquad (8)

Now we turn to real output. Appling the same process, we can derive the realized output under the assumption of the rational expectations:

$$y=-\theta\delta_4 p_{-1}+\theta\delta_3\bar{y}+\delta_4 c\bar{g}+[1/\tau]\varepsilon-[(a+b)/\tau]u$$
$$-[\delta_2\theta\phi\varphi/\tau]\varepsilon_{-1}-[\delta_2\theta/\tau]u_{-1}. \qquad (9)$$

The effects of the policy rules on output is clear and note-worthy. In the case of full accommodation in the supply side ($\beta=\gamma=1.$), from $\delta_4=0$ and $\delta_3=1/\theta$, the realized output depends only upon the normal output level and random variables:

$$y=\bar{y}+[1/\tau]\varepsilon-[(a+b)/\tau]u-[\delta_2\theta\phi\varphi/\tau]\varepsilon_{-1}-[\delta_2\theta/\tau]u_{-1}.$$

Hence, one of the standard implications of rational expectations appears: in this case, it can be said that discretionary (fiscal) policy is neutral to real output even in the short-run. It is apparent that full accommodation excludes stickiness in wage adjustment, arising vertical short-tun supply function. Notice, however, that (i) the exchange rate also should be fully accommodated since we introduced imported intermediate goods as one of the cost factors, and (ii) price and output might be indetermined when the three rules are fully accommodated at the same time. On the contrary, as far as β and γ are less than unity, the fiscal policy has effects on output in the short-run and furthermore the authorities can control the power of the fiscal policy by changing the extent to which β and γ are accommodated.

On the other hand, in the case of full accommodation of the money supply and exchange rate ($\alpha = \beta = 1$), from $\theta = 0$ and $\delta_4 = 1$, output depends upon only fiscal expenditure and the random variables:

$$y = c\bar{g} + [1/\tau]\varepsilon - [(a+b)/\tau]u.$$

This case implies that the demand curve stands vertically and output is demand-determined, completely neutral from supply conditions except the random noise. However, be aware that this random term includes the noises which have their origin in the supply side. In this sense, strictly speaking, full accommodation in the demand side can not completely eliminate the factors in the supply side (vice versa in the case of full accommodation of the supply side).

For the long-run analysis, subtracting p_{-1}, we can rewrite equation (9) in terms of a difference equation of y as:

$$y = \delta_4 y_{-1} + \theta\delta_3\bar{y} + [1/\tau]\varepsilon - [(a+b)/\tau]u$$
$$- [\delta_4(1+\theta\phi\varphi)/\tau]\varepsilon_{-1} + [\delta_4(a+b-\theta)/\tau]u_{-1}. \tag{10}$$

4. Long-Run Analysis

This section analyzes the impacts of the rules on price and output in the long-run. First, we derive a long-run equilibrium solution. If there exsists stable solution, long-run equilibrium solution is expressed in terms of mathematical means. Getting the unconditional means of equation (8) and (10), we derive the long-run solution of price and output:

$$\bar{E}(p) = (c\bar{g} - \bar{y})/\theta$$
$$\bar{E}(y) = \bar{y}$$

where, $\bar{E}(\ )$ denotes unconditional means.

It is worth mentioning that the long-run price movement is affected by the accommodating rules: the money supply and the exchange rate rule. With more accommodation, the multiplier becomes smaller, that is, the price trend turns out higher as far as $c\bar{g} > \bar{y}$, impling a inflationary spiral of accommodation, whereas γ has no

affect at all. As expected, the output trend is equal to the normal level which is determined by exogenous factors completely independent of the accommodating rules.

Now we turn to the analysis of deviation from long-run equilibrium. Let's define the deviations using long-run solution:

$$\tilde{p}=p-\bar{E}(p)$$
$$\tilde{y}=y-\bar{E}(y)$$
$$\tilde{\varepsilon}=\varepsilon-\bar{E}(\varepsilon)$$
$$\tilde{u}=u-\bar{E}(u).$$

From equation (8), we get the price equation in terms of deviation:

$$\tilde{p}=\delta_4\tilde{p}_{-1}+[\phi\varphi/\tau]\tilde{\varepsilon}+[\delta_2\phi\varphi/\tau]\tilde{\varepsilon}_{-1}+[1/\tau]\tilde{u}+[\delta_2/\tau]\tilde{u}_{-1}. \tag{11}$$

If the characteristic root of the homogeneous part of the equation is smaller than unity in absolute terms, a steady state solution exists and $\tilde{p}$ has stochastic movements around $E(\tilde{p})=0$ with a certain variance. The characteristic root of the homogeneous equation is given as:

$$\rho=\delta_4=[1-\phi\gamma-(1-\phi)\beta]/[1-\phi\gamma-(1-\phi)\beta+\phi\varphi\theta]$$

and as far as $0<\beta<1$ and $0<\gamma<1$, $0<\rho<1$ is satisfied. And the asymptotic variance of $\tilde{p}$ following ARMA (1, 1) is:

$$E(\tilde{p}^2)=[1+(\rho+\delta_2)^2/(1-\rho^2)]\{[\phi\varphi/\tau]^2\sigma_\varepsilon^2+[1/\tau]^2\sigma_u^2\}.$$

With regards to output, we can derive the steady state solution using the same process:

$$\tilde{y}=\rho\tilde{y}_{-1}+[1/\tau]\tilde{\varepsilon}-[(a+b)/\tau]\tilde{u}-[\delta_4(1+\theta\phi\varphi)/\tau]\tilde{\varepsilon}_{-1}$$
$$\qquad+[\delta_4(a+b-\theta)/\tau]\tilde{u}_{-1} \tag{12}$$
$$E(\tilde{y})=0$$
$$E(\tilde{y}^2)=\{[1/\tau]^2+[\rho\theta\phi\varphi/\tau]^2/(1-\rho^2)\}\sigma_\varepsilon^2$$
$$\qquad+\{[(a+b)/\tau]^2+[\rho\theta/\tau]^2/(1-\rho^2)\}\sigma_u^2.$$

After the above preparations we now investigate the effects of the accommodating rules focusing on ρ and asymptotic variances. Since characteristic root ρ implies a convergence speed from some deviated point to the steady state, ρ indicates the extent to which deviation is persisting. Hence, considering that a higher absolute value of ρ means a slower convergence speed, we understand that a higher value of ρ has a more persistent effect of disturbance on output and price, that is, the economy is more instable. The question then arises whether the accommodating rules accelerate or decelerate the convergence speed. We get, therefore, the partial differencials of the three rules on ρ:

$$\partial\rho/\partial\alpha>0,\quad \partial\rho/\partial\beta\gtrless0,\quad \partial\rho/\partial\gamma<0.$$

Each rule has different effects on ρ. With a more accommodating money supply, the real money stock becomes less sensitive to a price change. Hence, if the economy has an excess demand, for example, price should be adjusted to a greater extent in

order to clear the excess demand. On the other hand, a higher accommodating wage rule induces a lower value of ρ and rises the convergence speed. Since more accommodation reduces stickiness in the wage adjustment, real wage rises more quickly, so that the excess supply, for example, might be cleared by a lesser price change. With regards to the exchange rate rule, whether a higher accommodation rises or lowers the persistence of the disturbance, depends on the relative extent of two channels in the demand and supply side. The sign $\partial\rho/\partial\beta$ depends on:

$$b\phi(1-\gamma)-a(1-\alpha)(1-\phi),$$

where a greater share of imported goods in costs (smaller value of ϕ) tends to make the sign negative. Needless to say, when we ignore the imported intermediate goods, the exchange rate rule operates only in the demand side, and its effect on ρ is exclusively positive.

We now observe the variability of price and output. The impacts of unanticipated disturbances on price and output are also influenced by accommodating rules. In our model, the steady state solution of $\tilde{p}$ and $\tilde{y}$ oscilate around $E(\tilde{p})=0$ and $E(\tilde{y})=0$ with certain variances, which can be considered as one of the factors that rise the instability of the economy. The effects of the rules on the asymptotic variance of $\tilde{p}$ and $\tilde{y}$ are:

$$\partial E(\tilde{p}^2)/\partial\alpha>0, \quad \partial E(\tilde{p}^2)/\partial\beta\gtreqqless0, \quad \partial E(\tilde{p}^2)/\partial\gamma\gtreqqless0$$

$$\partial E(\tilde{y}^2)/\partial\alpha<0, \quad \partial E(\tilde{y}^2)/\partial\beta<0, \quad \partial E(\tilde{y}^2)/\partial\gamma<0.$$

Where, since the partial differencials of the coefficients of σ_ε^2 and σ_u^2 have the same sign in each case, the results are shown in terms of $E(\tilde{p}^2)$ and $E(\tilde{y}^2)$. The accommodation of the money supply and that of the exchange rate in the demand side rise the effects of stochastic disturbances on variance of $\tilde{p}$ through rising ρ, whereas the wage indexing and exchange rate accommodation in the supply side operates vice versa. But, being affected by prediction errors of price in period $t-1$ $(p_{-1}-p_{-1}^*)$ generated by the introduction of imported intermediate goods, the signs of the rules in supply side are undetermined. On the other hand, the variances of $\tilde{y}$ are always reduced by accommodation. In spite of the persistent effects of the rules in the demand side, each rule operates to stabilize real demand, real wage and real cost of imported goods, then reducing the effects of random variables in net terms. This will be easier to understand when we remember that more accommodation makes both the demand and the supply curve more vertical.

Finally, it is obvious from equation (11) that, when both money supply and exchange rate rules are fully accommodated at the same time, a steady state solution does not exist and $\tilde{p}$ follows a "random walk" as:

$$\tilde{p}=\tilde{p}_{-1}+\mu$$

$$\text{where, } \mu=[\phi\varphi/\tau]\tilde{\varepsilon}+[1/\tau]\tilde{u}+[\delta_2\phi\varphi/\tau]\tilde{\varepsilon}_{-1}+[\delta_2/\tau]\tilde{u}_{-1}$$

$$E(\tilde{\varepsilon}\tilde{u})=0, \quad E(\tilde{\varepsilon}\tilde{\varepsilon}_{t-k})=0, \quad E(\tilde{u}\tilde{u}_{t-k})=0.$$

5. Sticky Wage Adjustment

Taylor [6] developed a macro model of the sticky wage adjustment of overlapping wage contracts where disturbances have persistent effects on output and price. Here we discuss another form of sticky wage adjustment, in which the stickiness appears because the wage indexing rule is applied to the inflation rate of the previous period $(p_{-1}-p_{-2})$, as it is true for the Brazilian wage indexing rule.

Suppose that the wage adjustment is determined by the wage indexing rule and the market condition as:

$$w-w_{-1}=\gamma(p_{-1}-p_{-2})+\varphi(y-\bar{y}).$$

Since at the beginning of period t, the inflation rate of the previous period $t-1$ is known to the authorities, the expectations now disappear in the wage adjustment. Neglecting imported intermediate goods for simplification, we get the aggregate supply function:

$$p-p_{-1}=\gamma(p_{-1}-p_{-2})+\varphi(y-\bar{y})+u.$$

Using the same process as in the preceding section, we obtain the rationally expected price, the realized price and output in the form of a second order difference equation:

$$E(p)=[(1+\gamma)/(1+\varphi\theta)]p_{-1}-[\gamma/(1+\varphi\theta)]p_{-2}$$
$$\qquad+[\varphi/(1+\varphi\theta)](c\bar{g}-\bar{y})$$
$$p=E(p)+[\varphi/\pi]\varepsilon+[1/\pi]u$$
$$\quad\text{where, } \pi=1+(a+b)\varphi$$
$$y=-\theta[(1+\gamma)/(1+\varphi\theta)]p_{-1}+\theta[\gamma/(1+\varphi\theta)]p_{-2}+\theta[\varphi/(1+\varphi\theta)]\bar{y}$$
$$\qquad+[1/(1+\varphi\theta)]c\bar{g}+[1/\pi]\varepsilon+[(a+b)/\pi]u.$$

Because of the existence of the stickiness in the wage adjustment, even when the indexing rule is fully accommodated ($\gamma=1$), the Lucas type supply curve does not appear now and output is not neutral to price and fiscal policy. It is interesting to note, however, that if the two rules in the demand side are fully accommodated ($\alpha=1$ and $\beta=1$, then $\theta=0$), output is still neutral to p_{-1}, p_{-2} and $\bar{y}$ depending only on $c\bar{g}$ and random noises as in the preceding section.

Now let's turn to the long-run analysis. Defining the deviation of price from the long-run equilibrium as:

$$\tilde{p}=p-\bar{E}(p)$$
$$\quad\text{where, } \bar{E}(p)=(c\bar{g}-\bar{y})/\theta,$$

we get the price equation in terms of deviation:

$$\tilde{p}=[(1+\gamma)/(1+\varphi\theta)]\tilde{p}_{-1}-[\gamma/(1+\varphi\theta)]\tilde{p}_{-2}+[\varphi/\pi]\tilde{\varepsilon}+[1/\pi]\tilde{u}.$$

From the homogeneous part of the equation, the roots are given by quadratic formula:

$$\rho=\frac{1}{2}\left\{\frac{1+\gamma}{1+\varphi\theta}\pm\sqrt{\left(\frac{1+\gamma}{1+\varphi\theta}\right)^{2}-\frac{4\gamma}{1+\varphi\theta}}\right\}.$$

If the roots are real, as far as the condition $\gamma > \varphi\theta$ is satisfied, the two roots in absolute terms are less than unity and the solution is stable. If the roots are complex, the absolute value of the roots are given as $\sqrt{\gamma/[1+\varphi\theta]}$, impling less than unity. However, when supposing the probable value of the parameters, we should accept the complex roots as stable roots. The effects of the accommodating rules on ρ in the case of complex roots are given:

$$\partial\rho/\partial\alpha > 0, \quad \partial\rho/\partial\beta > 0, \quad \partial\rho/\partial\gamma > 0.$$

The difference with the preceding model is that more accommodation in wage indexing lowers the convergence speed and increases persistent effects, since the stickiness, introduced by the lagged indexing rule, is enforced by the accommodation.

The steady state solution of $\tilde{p}$ is expressed as follows:

$$\tilde{p} = \rho\tilde{p}_{-1} + [\varphi/\pi]\tilde{\varepsilon} + [1/\pi]\tilde{u}$$

$$E(\tilde{p}) = 0$$

$$E(\tilde{p}^2) = [\varphi/\pi]^2[1/(1-\rho^2)]\sigma_\varepsilon^2 + [1/\pi]^2[1/(1-\rho^2)]\sigma_u^2.$$

Another information to observe the macro instability is the variance of $\tilde{p}$ and $\tilde{y}$ produced by stochastic disturbances. The effects of the rules on variance of $\tilde{p}$ are:

$$\partial E(\tilde{p}^2)/\partial\alpha > 0, \quad \partial E(\tilde{p}^2)/\partial\beta > 0, \quad \partial E(\tilde{p}^2)/\partial\gamma > 0,$$

where, the partial differencials of each rule on the coefficient of σ_ε^2 and σ_u^2 have the same sign. As we expected, the accommodation in the three rules rises the asymptotic variance of $\tilde{p}$, that is, it rises the instability of price. In the same way, the long-run solution of output is given as:

$$\bar{E}(y) = \bar{y}$$

$$\tilde{y} = \rho\tilde{y}_{-1} + [1/\pi]\tilde{\varepsilon} - [(a+b)/\pi]\tilde{u} + [\rho(1+\theta\varphi)/\pi]\tilde{\varepsilon}_{-1}$$
$$+ [\rho(a\alpha + b\beta)/\pi]\tilde{u}_{-1}$$

$$E(\tilde{y}) = 0$$

$$E(\tilde{y}^2) = \{[1/\pi]^2 + [\rho^2\theta^2\varphi^2/(1-\rho^2)\pi^2]\}\sigma_\varepsilon^2$$
$$+ \{[(a+b)/\pi]^2 + [\rho^2\theta^2/(1-\rho^2)\pi^2]\}\sigma_u^2.$$

Hence, the effects of the rules on the variance of output are:

$$\partial E(\tilde{y}^2)/\partial\alpha < 0, \quad \partial E(\tilde{y}^2)/\partial\beta < 0, \quad \partial E(\tilde{y}^2)/\partial\gamma > 0.$$

Although accommodations in the money supply and the exchange rate reduce the variance of output by stabilizing demand, wage indexing rises it. The reason is clear: more accommodation not only rises stickiness in the wage adjustment but also induces a lower convergence speed. Thus, with more accommodation in the lagged wage indexing, the steady state solution of output has a path with higher variance, which can be interpreted as greater instability of the economy. This point is important in the context of the Brazilian wage indexing rule.

Finally, the model in this section also displays the price random walk in case of full accommodation. When $\alpha = \beta = \gamma = 1$, the solution has equal roots $\rho = 1$. Then,

$$\tilde{p} = \tilde{p}_{-1} + \mu$$

where, $\mu=[\varphi/\pi]\bar{\varepsilon}+[1/\pi]\bar{u}$.

6. Tests of the Random Walk Hypothesis

In the preceding sections, we developed a macro model of the accommodating policy
rules, in which, with full accommodation prices in terms of deviation from the long-
run trend, follow a random walk. It is widely accepted that since 1968 Brazil has
experienced almost fully accommodated exchange rate and wage indexing policies.
And if we accept the assertion[1] that the Brazilian money supply also has been ac-
commodated to price levels, it is worth testing the random walk hypothesis[2].

We specify estimating equation by using the inflation rate as a proxy for the
price deviation from trend, because the data for the deviation are generally difficult
to obtain, and the following manipulation can derive a random walk process in terms
of the inflation rate without any loss of generality. Subtracting both sides of the
following equations respectively,

$$p-\bar{p}=p_{-1}-\bar{p}+\mu$$
$$p_{-1}-\bar{p}=p_{-2}-\bar{p}+\mu_{-1}$$

the random walk in the inflation rate can be derived under the assumption of the
white noise process. The stimating equation is:

$$\hat{p}=\alpha_0+\alpha_1\hat{p}_{-1}+\mu$$

From the definition of the random walk, we expect the following three properties:
(a) The constant term should not differ significantly from zero.
(b) The slope coefficient should not differ significantly from unity.
(c) The residuals should not be serially correlated.
The equation was estimated using quarterly data for two periods: (1) 1968.I–1982.II
and (2) 1974.I–1982.II. Two kinds of inflation rates were calculated using the data
of International Financial Statistics/IMF: whole sale price index (IFS line: 22363)
and consumer price index (IFS line: 22364). The resulting OLS estimates are reported
in **Table 1**, including other regression results; $\bar{R}$: coefficient of determination, DW:
Durbin-Watson statistics, DH: Durbin's h statistics, DF: degree of freedom, ( ):
t ratio.

As can be seen, the results are consistent with the hypothesis. In all cases, the
null hypothesis can not be rejected at the 95% confidence level, that is, α_0 and α_1 do
not differ significantly from zero and one respectively. Furthermore, DW and DH
statistics are consistent with the hypothesis of serially uncorrelated residuals at the
95% confidence level except DH of CP in 1968.I–1982.II. Thus, we can accept, not
highly robustly, the hypothesis that the Brazilian inflation rates follow "random

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1) See Cardose [1] and Contador [3].
2) See Cardoso [2].

Table 1. Estimation of $\hat{p}=\alpha_0+\alpha_1\hat{p}_{-1}+\mu$

	α_0	α_1	$\bar{R}^2$	DW/DH	DF
		1968.I−1982.II			
WP	0.0100	0.9189	0.8001	2.1693	56
	(1.5387)	(1.3359)		−0.7269	
CP	0.0093	0.9266	0.8089	2.4865	56
	(1.5400)	(1.2328)		−2.0786	
		1974.I−1982.II			
WP	0.0223	0.8557	0.7271	2.0578	32
	(1.8125)	(1.5899)		−0.1985	
CP	0.0242	0.8321	0.6839	2.4140	32
	(1.9654)	(1.7167)		−1.4695	

WP: whole sale price inflation rate
CP: consumer price inflation rate

Table 2. Test of Joint Hypothesis: F value

	1968.I−1982.II		1974 I−1982 II	
	WP	CP	WP	CP
Brazil	1.1890	1.1973	1.6645	1.9550
Argentina	7.7802	7.5608	6.4418	6.1495
Chile	14.1980	4.3839	116.6741	19.1207
Colombia	8.6399	12.3555	12.4146	12.7944
West Germany	8.3413	15.3161	5.1415	8.4678
France	11.6499	3.9668	6.8546	5.0776
Israel	1.5018	2.1995	1.8963	2.8732
Japan	5.1884	10.6625	5.1138	5.5402
Korea	9.5173*	10.2350*	7.4690	8.9284
Mexico	5.1623	2.2147	5.1841	2.8589
Portugal	12.7140	29.3972	8.6198	35.4194
United Kingdom	4.9562	10.0770	3.1596	7.9652
United States	10.0929	25.7848	6.7529	18.8741
Venezuela	14.4985	6.0065	14.4421	5.8008
	DF:F (2,56)		DF:F (2,32)	
	1% point: 5.01		1% point: 5.34	
	5% point: 3.17		5% point: 3.30	

(*) The period is 1970.II−1982.II, then DF is F (2,46).

walk".

In addition to this, we estimated the joint hypothesis that the constant terms are zero *and* the slope coefficients are unity. Hypothesis testing for joint hypothesis is done with the F test and its results for various countries are shown in **Table 2**. As we see, very few countries (Brazil, Israel, CP of Mexico and WP of United Kingdom in the second period) are not able to reject the joint hypotheses at the 5% singnificance level. Almost all other countries can reject it at the 1% level. Furthermore, it is shown that Brazil and Israel have the lowest F values among these countries. Remembering that Israel is the country which applies indexing rules in broad areas like Brazil, we

can say that our estimation reveals the closed relation between accommodation policy rules and price instability as analized in the model.

7. Concluding Remarks

In this paper, we developed a stochastic macro model, in which accommodating policy rules are analyzed. The demand side of the model comes from the standard IS-LM model and the supply side is based on the Lucas function. The model treats three accommodating rules in money supply, exchange rate and wage adjustment. We assume that the authorities apply these rules according to their expectations. Under the assumption of rational expectations, we investigated the effectiveness of the rules on the stability of price and output, focusing on persistent effects of disturbance and variability of price and output which are affected to the extent to which the rules are accommodating. The main conclusions are as follows: (1) Full accommodation in the exchange rate and wage adjustment produces the same implication as the standard rational expectation model, and also full accommodation in the demand side (in money supply and exchange rate) demonstrates the same situation in which the discrecionary (fiscal) policy is neutral to output. (2) More accommodation in the money supply rises persistent effects, whereas that of wage indexing lowers them. The exchange rate rule affects through two channels because of the existence of imported goods. (3) The model reveals the stability trade-off between output and price level in the context of variance. It is shown, however, that the existence of imported goods and lagged wage indexing affects the relations between the accommodating rules and the output-price trade off. (4) The model suggests that price deviation from trend follows "random walk". We tested this hypothesis using the inflation rate as a proxy for Brazil and we accepted the hypothesis.

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A SIMPLE GENERAL EQUILIBRIUM MODEL
INVOLVING A MAXIMIZING LABOUR UNION

Kazuo SHIMOMURA

1. Introduction

The purpose of this paper is to construct a fairly simple general equilibrium model involving a maximizing labour union and to outline the micro-economic theory of a maximizing labour union. Kemp [1] provides a similar framework as the one which we are concerned with here. The distinctive features of the model presented in this paper are;

(1) The determination of units of labour service supplied by each worker is explicitly taken into account.

(2) The utility function of the union takes a general form.

(3) A sufficient condition for the existence of a union-ridden equilibrium involving unemployment is obtained.

   Assumptions and basic framework are stated (Section 2), preliminary analysis with respect to the behavior of workers carried out (Section 3) and some results obtained (Section 4).

2. Assumptions and Basic Framework

At first let us state the assumptions.

A.1 There exist N_s households who earn their income only from providing their labour services measured by time, say hours. Let this kind of household be called "worker." Each worker has his preference regarding consumption and leisure which is represented by the following utility function;

(1) $u=u(c, T-l)$

where c is the amount of the consumption good, T the total available time for each worker and the amount of labour service. So that $T-l$ is the time for leisure. Each worker determines c and l for a given real wage rate so as to maximize (1) subject to his budget constraint

(2) $Rl \geqq c$

, where R is the real wage rate, and

(3) $T-l \geqq 0$

A.2 There is another type of household which provides a non-labour factor of

production and which expends all income to purchase consumption goods.

A.3 There is only one kind of consumption goods. Each firm which produces the good is quite small so that the market can be regarded as perfectly competitive. The production function is denoted by

(4) $Y=f(L)$

where L is the amount of labour service measured by time, say L hours. The function $f(\ )$ has the following properties.

(5) $f'(L)>0$ for any $L>0$

(6) $f''(L)<0$ for any $L>0$

(7) $f(O)=0$

(8) $\lim_{L\to\infty} f(L)=\infty$

(9) $\lim_{L\to\infty} f'(L)=0$

(10) $\lim_{L\to0} f'(L)=\infty$

Each firm seeks to maximize its profit

(11) $f(L)-RL$

by choosing an appropriate L. Then one obtains, as a necessary condition for optimality,

(12) $f'(L)=R$

A.4 Just a single labour union exists, to which all workers belong. What the labour union is concerned with are supposed to be (i) the level of welfare each employed worker can enjoy and (ii) the number of employed workers. Let (ii) be N. The union negociates with the firms about (i) and (ii). In the present paper we assume that the union enables firms to pay for each employed worker *at least* a certain level of wage rate, say R_{min} and that, regarding the volume of labour service, the firms decide it according to (12). With respect to the determination of R_{min}, it is assumed that the union is rational enough to hold perfect knowledge about the structure of the economy which includes even the preference of each worker and that for a given level of $\bar{u}$ the union seeks to solve the optimal problem;

(13)   Minimize R
           c, l, R

                 subject to $\bar{u}\leq u(c, T-l)$

                           $T-l\geq0$

           and

                 $Rl\geq c$

Under some regularity conditions on the utility function, the optimal c, l and R can be uniquely obtained. R_{min} then is defined as the optimal R. Obviously R_{min} is the function of $\bar{u}$.

Based on the foregoing argument on the determination of R_{min}, it might be

fairly reasonable to assume that the union's utility is the function of the welfare level of each employed worker and the number of the employed;

(14) $U=U(u, N)$

(15) $\dfrac{\partial U}{\partial u} \equiv U_u > 0$

(16) $\dfrac{\partial U}{\partial N} \equiv U_N > 0$

One should notice that u might be different from $\bar{u}$ which the union seeks to ensure for each employed worker, although the former will never be smaller than the latter. It is also apparent that the inequalities

(17) $u \geqq \bar{u} \geqq u^* \equiv u(0, T)$

are always held. As will become clear through the subsequent argument, u and N are the functions of $\bar{u}$, i.e.,

(18) $U=U(u(\bar{u}), N(\bar{u}))$

The union's objective is to maximize (18) by choosing an appropriate $\bar{u}$.

We have stated the main assumptions for the present argument. Now before starting the analysis, let us define two equilibrium concepts.

(i) Equilibrium; defined as the equality between the demand for the consumption good and the supply of it *for a given level of* $\bar{u}$.

(ii) Union-ridden equilibrium; defined as the equilibrium where the union chooses the optimal $\bar{u}$.

3. Preliminary Analysis

First of all let us carry out a simple analysis on the optimal problem (13). The Lagrangian function of the problem is

(19) $H = -R + p_1(u(c, T-l) - \bar{u}) + p_2(T-l) + p_3(Rl-c)$

Then one obtains, as the necessary conditions for the optimality,

(20) $\dfrac{\partial H}{\partial R} = -1 + lp_3 \leqq 0$, $\dfrac{\partial H}{\partial R} R = 0$

(21) $\dfrac{\partial H}{\partial c} = p_1 u_1 - p_3 \leqq 0$, $\dfrac{\partial H}{\partial c} \cdot c = 0$

(22) $\dfrac{\partial H}{\partial l} = -p_1 u_2 - p_2 + p_3 R \leqq 0$, $\dfrac{\partial H}{\partial l} l = 0$

(23) $\dfrac{\partial H}{\partial p_1} = u - \bar{u} \geqq 0$, $\dfrac{\partial H}{\partial p_1} \cdot p_1 = 0$

(24) $\dfrac{\partial H}{\partial p_2} = T - l \geqq 0$, $\dfrac{\partial H}{\partial p_2} p_2 = 0$

(25) $\dfrac{\partial H}{\partial p_3} = Rl - c \geqq 0$, $\dfrac{\partial H}{\partial p_3} p_3 = 0$

(26) $R \geqq 0,\ l \geqq 0,\ c \geqq 0,\ p_1 \geqq 0,\ p_2 \geqq 0,\ p_3 \geqq 0$

Having a look at these conditions, one can obtain the following lemmata.

Lemma 1: If $\bar{u}$ is chosen as being greater than u^*, then the optimal l and R, $R_{\min}$, are positive.

Proof: Suppose that l is zero. Then from (20), R must be zero. Thus, considering (25), c must be also zero, which implies that $u(0, T)-\bar{u}=u^*-\bar{u}\geqq0$, a contradiction. Next suppose that $R_{\min}$ is zero. Then from (25) again, c must be zero, which implies that $0\leqq u(0, T-l)-\bar{u}<u^*-\bar{u}$, a contradiction.

<div align="right">QED</div>

Lemma 2: Under the same presumption as lemma *1*, $Rl=c$.

Proof: If Rl is greater than c, then p_3 is zero. Therefore, from (20), R must be zero, a contradiction.

<div align="right">QED</div>

In order to make the present argument clearer, we add a restraint to the shape of the utility function of each worker. In what follows, it is assumed that leisure is "indispensable", i.e., for any $c\geqq0$, $c'\geqq0$ and $l\geqq0$ where $T-l\geqq0$,

(27) $u(c, T-l)\geqq u(c', 0)$

Under this additional condition, one can obtain the following lemmata.

Lemma 3: $T-l$ is positive.

Proof: Obvious from (27).

Lemma 4: p_1 and p_3 are positive.

Proof: From (20), it is obvious that $p_3=l^{-1}>0$. Thus, considering (21) or (22), p_1 must be positive.

<div align="right">QED</div>

Then one obtains

Proposition 1: If $\bar{u}>u^*$ and $u(c, T-l)\geqq u(c', 0)$ for any nonnegative c, c' and l, then the necessary conditions for optimality with regard to the problem (13) are

(28) $Ru_1(c, T-l)=u_2(c, T-l)$

(29) $u(c, T-l)=\bar{u}$

(30) $Rl=c$

One can easily understand what these conditions are by looking at **Figure 1**. Assuming that the utility function is strictly quasi-concave like the figure, the point E is the sole optimal solution. Now, let us examine the effect of the change of $\bar{u}(\bar{u}\rightarrow\bar{u}'$ like Figure 1) on the optimal c, l and R. Totally differentiating (28), (29) and (30), we have

(31) $\dfrac{dR}{d\bar{u}}=\dfrac{1}{lu_1}>0$

However, regarding $\dfrac{dc}{d\bar{u}}$ and $\dfrac{dl}{d\bar{u}}$, the signs depend on the relative extent of the income effect to the substitution effect. See Appendix. In the meantime we assume

Figure 1
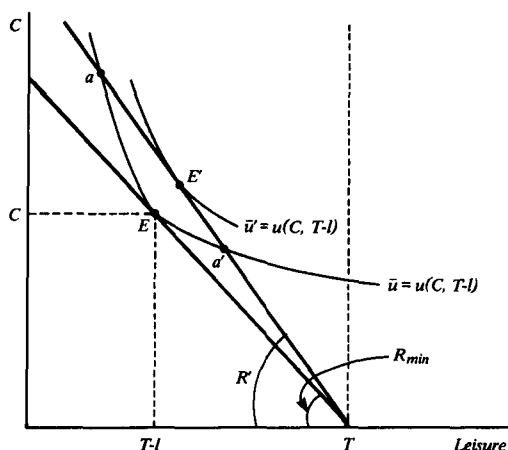
that the substitution effect overweighs the income effect, so that

(32) $\quad \dfrac{dc}{d\bar{u}} > 0$

(33) $\quad \dfrac{dl}{d\bar{u}} > 0$

Later the case that $\dfrac{dl}{d\bar{u}}$ is negative shall be briefly mentioned. In fact both cases are possible in reality.

4. Equilibrium Locus and Union-Ridden Equilibrium

Suppose, for a while, that the labour union fixes $\bar{u}$ at a certain level which is greater than u^*. Then, based on the argument of the previous section, $R_{\min}$ and l are regarded as the functions of $\bar{u}$, $R_{\min}(\bar{u})$ and $l(\bar{u})$. Making the bargaining with the firm, the union claims (1) the firm's paying *at least* $R_{\min}(\bar{u})$ for each unit of time provided as labour service, l, so as the following inequalities to be held;

(34) $\quad \bar{u} \leq u(Rl, T-l), \quad R \geq R_{\min}(\bar{u})$

See Figure 1. If R is equal R'. then the segment $aE'a'$ represents the region where (34) is held. If R is equal $R_{\min}(\bar{u})$, only $l(\bar{u})$ is chosen as the amount of labour service provided by each employed worker.

Now suppose that the firm accepts $R_{\min}(\bar{u})$. Then the firm demands for an amount of labour service to the extent of L satisfying

(35) $\quad R_{\min}(\bar{u}) = f'(L)$

Thus the number of the employed is

(36) $\quad N = \dfrac{L}{l(\bar{u})}$

which is the function of $\bar{u}$, considering (35). Furthermore, N increases as $\bar{u}$ falls. For,
(*i*) L increases as $\bar{u}$ falls from (37) and (ii) $l(\bar{u})$ decreases as $\bar{u}$ falls from (33).

For a given $\bar{u}$, two possibilities can be considered; $N \geq N_s$ and $N < N_s$. Let us inspect both cases in turn.

$\underline{N \geq N_s}$ If N happens to be equal N_s, an equilibrium without unemployment is established. The market R is also equal $R_{\min}(\bar{u})$. Denote such $\bar{u}$ by $\bar{u}_b$ in what follows. Next if $N > N_s$, at $R = R_{\min}(\bar{u})$ an excess demand for labour occurs and R rises over $R_{\min}(\bar{u})$. As a result, L, now determined by $R = f'(L)$, decreases. On the other hand l, now depending on R, rises because of (33). So that, N decreases and comes to be equal N_s. In equilibrium both the market R and the level of welfare u are greater than $R_{\min}(\bar{u})$ and $\bar{u}$, respectively. It is also apparent that such $\bar{u}$ is smaller than $\bar{u}_b$. Not only this, one can state that u is equal $\bar{u}_b$.

$\underline{N < N_s}$ Although the labour market is in disequilibrium at $R = R_{\min}(\bar{u})$, some workers are unemployed since R cannot fall under $R_{\min}(\bar{u})$. Equilibrium involving unemployment is established. It is obvious that the market R is equal $R_{\min}(\bar{u})$ and that such $\bar{u}$ is greater than $\bar{u}_b$. Considering (33), one can also state that N decreases as $\bar{u}$ rises.

Based on the foregoing inspection, one can obtain the relationship between the level of welfare each employed worker enjoys in equilibrium, u, which obviously depends on $\bar{u}$, and the number of the employed. The relationship can be described like the curve ab in **Figure 2**. Letting the curve ll' be an indifference curve of the union's utility function $U = U(u, N)$, the point E_u represents the union-ridden equilibrium *involving unemployment*, where the level of welfare each worker enjoys, the wage rate and the number of the employed are expressed as u_e, $R_{\min}(u_e)$ and N_e in the figure, respectively.

Whether the union-ridden equilibrium *involving unemployment* is established or not depends on the difference in the slope at b in Figure 2 between the equilibrium

Figure 2
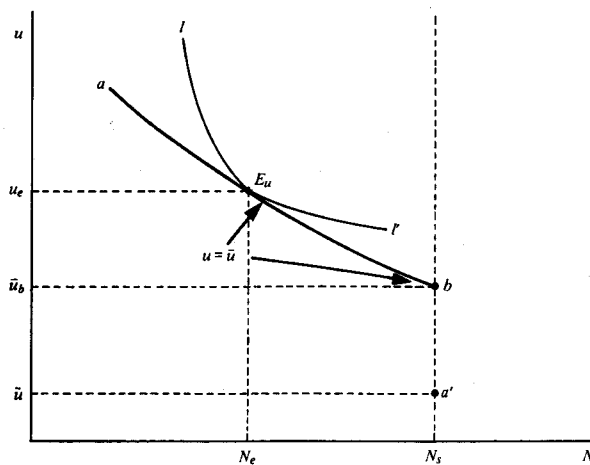
curve ab and the indifference curve of the union's utility function which happens to pass through b. If at this point b the absolute value of the slope of the indifference curve is greater than the one of the slope of the curve ab, then the point b is the union-ridden equilibrium. On the contrary, if smaller, b cannot be such a point and the union-ridden equilibrium, if it exists, must involve a certain level of un-employment.

Proposition 2: Suppose that the union-ridden equilibrium, at any rate, exists. It involves unemployment if at the point b the marginal rate of substitution of the union's utility function

(37) $\dfrac{U_u}{U_N}$

is smaller than

(38) $\left| \dfrac{dN}{d\bar{u}} \right|_{\substack{\text{the curve} \\ ab}}$

Now let us make some remarks on the existence and the uniqueness of the union-ridden equilibrium. If the indifference curves of the union's utility function are like $\bar{u}_1$, $\bar{u}_2$, $\bar{u}_3$,..., in **Figure 3**, i.e., if the union attaches much importance to the welfare of the employed even when the rate of unemploymet is quite high, then the union-ridden equilibrium might not exist.

Remark: A sufficient condition for the existence of the union-ridden equilibrium is that the elasticity of substitution between u and N of the union's utility function is smaller than 1.

Literally, this condition means that the union does not sacrifice the volume of employment in order to raise the level of the welfare of the employed when the number of the unemployed is quite large. Regarding the uniqueness, one cannot

Figure 3
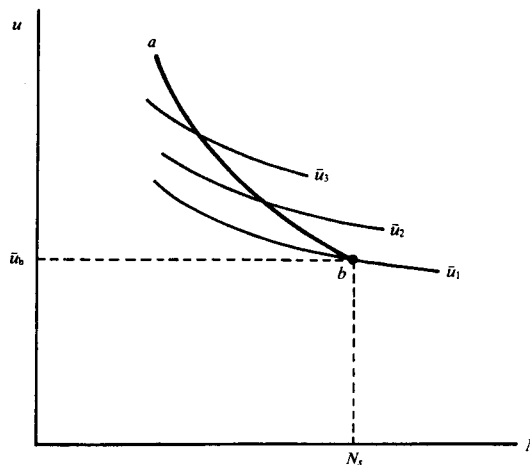
Figure 4
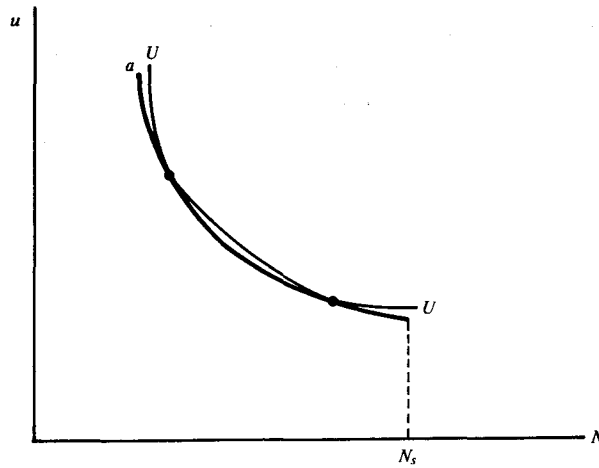
Figure 5
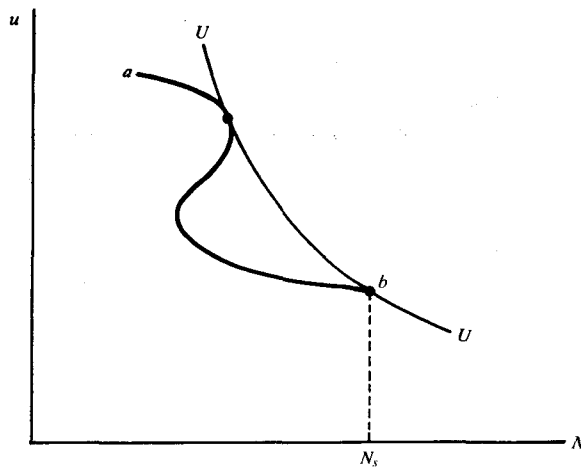
exclude the possibility of multiple union-ridden equilibria. In fact it is possible that the curve ab is like the one in **Figure 4** where two union-ridden equilibria exist.

We have assumed that with respect to the preference of each worker between consumption and leisure the substitution effect is large enough to overweigh the income effect.

On the contrary, if the income effect is negative and exceeds the substitution effect, then l rises as $\bar{u}$ takes on greater value. Then it might be realized that the curve ab has an upward portion like in **Figure 5**.

Appendix Let us examine the system composed of (28), (29) and (30). Substituting

(30) to the other equations, we have

(39) $Ru_1(Rl, T-l)=u_2(Rl, T-l)$

(40) $u(Rl, T-l)=\bar{u}$

Differentiating (39) and (40) with regard to R, l and $\bar{u}$,

(41) $(R^2u_{11}-2Ru_{12}+u_{22})dl+(Rlu_{11}+u_1-lu_{21})dR=0$

(42) $lu_1, dR \qquad =d\bar{u}$

From (42), one can obtain (31). Further,

(43) $\dfrac{dl}{d\bar{u}} = \dfrac{u_1+l(Ru_{11}-u_{21})}{(2Ru_{12}-R^2u_{11}-u_{22})lu_1}$

Strict quasi-concavity ensures that $(2Ru_{12}-R^2u_{11}-u_{22})$ is positive. However the sign $(u_1+Ru_{11}-u_{21})$ is indefinite. It depends on, as stated earlier, the relative extent of the income effect to the substitution effect. To see this, consider the following simple optimal problem;

(44)   Maximize $u(c, T-l)$
       c, l

           subject to $A=c-Rl$

                for given A, R and T

The Lagrange function is

(45) $H=u(c, T-l)+p(A-c+Rl)$

The first onder conditions for optimality is then

(46) $\dfrac{\partial H}{\partial c}=u_1(c, T-l)-p=0$

(47) $\dfrac{\partial H}{\partial l}=-u_2(c, T-l)+pR=0$

(48) $\dfrac{\partial H}{\partial p}=A-c+Rl=0$

Differentiating (46), (47) and (48) with respect to c, l, R and A, we have

(49) $\dfrac{\partial l}{\partial R}\bigg|_{(44)} = \dfrac{u_1+l(Ru_{11}-u_{21})}{(2Ru_{12}-R^2u_{11}-u_{22})}$

(50) $\dfrac{\partial l}{\partial A}\bigg|_{(44)} = \dfrac{(Ru_{11}-u_{21})}{(2Ru_{12}-R^2u_{11}-u_{22})}$

Next check the optimal problem

(51)   Minimize $A \equiv c-Rl$
       c, l

           subject to $\bar{u}=u(c, T-l)$

                for given R and $\bar{u}$

The first order conditions for optimality are again

(52) $Ru_1-u_2=0$

and

(53) $u-\bar{u}=0$

From (52) and (53),

(54) $\quad \dfrac{dl}{dR}\Big|_{(51)} = \dfrac{u_1}{2Ru_{12}-R^2u_{11}-u_{22}}$

which is definitely positive. Therfore, from (31), (50) and (54), (43) becomes

(55) $\quad lu_1\dfrac{dl}{d\bar{u}}\Big|_{(43)} = \dfrac{dl}{dR}\Big|_{(51)} + l\dfrac{\partial l}{\partial A}\Big|_{(44)}$

The first term of the RHS is definitely positive and represents the substitution effect, while the second term whose sign is ambiguous the income effect.

At last let us check the relationship between N and $\bar{u}$. Considering (12), (42) and (43), we see

(56) $\quad \dfrac{d}{d\bar{u}}N = \dfrac{d}{d\bar{u}}\left(\dfrac{L}{l}\right)$

$\qquad\qquad = \dfrac{1}{l}\left[\dfrac{1}{f''\cdot lu_1} - N\cdot\dfrac{dl}{d\bar{u}}\right]$

So that, as for as $\dfrac{dl}{d\bar{u}}$ is positive, $\dfrac{d}{d\bar{u}}N$ is negative.

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HISTORICAL SKETCH

In 1919, a research organization named the Institute for Commerce was founded in Kobe Higher Commercial School, one of the chief predecessors of Kobe University, with a gift made by F. Kanematsu & Company, a leading mercantile firm in Kobe. The organization was designed to carry on and facilitate integrated research on business and commerce and to formulate and publish the results of these studies and investigations in such form as to make them available to the business community.

With the founding of Kobe University of Commerce, successor of Kobe Higher Commercial School, in 1929, the Institute extended its research activities by adding several divisions. One was the famous Latin-American Library, which soon became the center of research in this field in Japan. A room for statistics equipped with various computing machines was established and began publication of *Jūyō Tōkei Keizai* monthly and *Sekai Bōeki Tōkei* annually. A filing room was prepared to deposit press clipping files systematically arranged by topics and dates. Another room was designed to become the center of all possible original records and data having to do with the beginning and progress of Japanese business.

On the campus of Kobe University of Commerce, another organization mamed the Institute for Business Mechanization was founded in 1941 utilizing business machines donated by the IBM Corporation and others. With Professor Yasutaro Hirai as its head a broad and forward-looking plan for business mechanization in Japan was developed.

In 1944, Kobe University of Commerce changed its name to Kobe University of Economics. After the War, however, the University was consolidated with three other colleges in Hyogo Prefecture to become Kobe University. With this development, the two Institutes were also amalgamated into the Research Institute for Economics and Business Administration, Kobe University. At present, the Institute, with its nineteen full-time professional staff members, carries on studies and investigations in international economics, international

environment, comparative economics, international business and management information systems.

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The Institute consists of five sections. Each section and its research subjects are as follows:

1. **International Economic Studies**
   International Economics, International Monetary Economics,
   Maritime Economics, International Labor Relations
2. **International Environmental Studies**
   Resource Development, International Organizations,
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3. **Comparative Economic Studies**
   Pacific Basin I (Oceanian Economy),
   Pacific Basin II (North and South American Economics)
4. **International Business Studies**
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In addition to the ordinary work of each section, several research committees, whose members are not limited to the Institute staffs, are regularily held to carry on joint studies. At present, there are seven standing research committees, as follows: Experts Group on the World Trade Structure, Committee of International Finance, Committee of Maritime Economics, Committee of International Studies on Economic and Industrial Structure, Committee of International Comparative Economics, Committee of International Business Behavior and Committee of Management Information Systems.

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As an affiliated institute, the Documentation Center for Business Analysis has been established in 1964. It is the first systematic information facilities in the field of business administration in Japan that has been recognized and authorized by the Ministry of Education. The purpose is to collect and to make intensive control of all kinds of materials on business administration and to make them available to scholars, universities, governments, and business world with the aid of modern documentation techniques.