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THE UNIVERSITY OF CHICAGO

# MONEY & BANKING REGULATION

# THE WELFARE COSTS OF INFLATION

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE DIVISION OF THE SOCIAL SCIENCES

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

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TABLE OF CONTENTS

## LIST OF ILLUSTRATIONS

Figures | Page

# CHAPTER I

# INTRODUCTION

This thesis proposes formulas to evaluate the welfare costs of both anticipated inflation and banking regulation, so as to compare with Bailey's (1956) triangle under demand for money schedule, depending on whether banks compete with interest, fee or service in the market for deposits.

The issue was first motivated by observing the behavior of Brazilian banking industry during the 1986 Cruzado Stabilization Plan. In that time, there were sharp swings in the short-run inflation rates. When inflation declined, the national commercial banks became oversized and the only alternative left was to downward adjust, mainly, in terms of bank labor, equipment, and branches. But once inflation returned to its previous trend, this industry basically demanded almost the previous real resources. Furthermore, the Brazilian commercial banking industry is characterized by certain institutional rules, which induce more service than price competition. It results from: (a) the prohibition of payment of interest on demand deposits; (b) a competitive market for loans; (c) the imposition of high reserve requirements only on demand deposits; and (d) the usual nonpayment of interest on banking reserves by the "Banco Central do Brasil."

In this financial system, the monetization of the fiscal deficit causes a phenomenon known as bank rent seeking activity. Banks offer clients almost free service, which allows individuals time saved on transactions -- social benefit. But service provision requires real resources -- social costs.

The service or non-price competition stems from the ability to attract non-interest paid deposits, which render banks a potential inflation tax rent. In this case, the spread on financial intermediation is the difference between the market interest rate on loans and the marginal cost of service. While the value of rent is equal to this spread multiplied by the total amount of financial resources intermediated.

Some stylized facts illustrate both the potential inflation tax rent and the resources required by the banking industry to provide service. Table 1 below shows the seigniorages collected by the Brazilian financial institutions (Central Bank and the private and official banks). All calculations are defined in real terms. Although the average annual seigniorage captured by the Central Bank on monetary base was 2.2% of GNP during the 1970-88 period, it resulted in $110 billion, in accumulated real terms over this period. Meanwhile, the Brazilian financial institutions had together a potential rent equivalent to the entire 1988 GNP ($300 billion), in accumulated real terms over that same period.

TABLE 1

SEIGNIORAGES CAPTURED BY THE PUBLIC SECTOR AND PRIVATE COMMERCIAL BANK AS PERCENTAGE OF GNP (%). BRAZIL: 1970-88.

| YEARS | CENTRAL BANK (monetary base) (1) | PUBLIC SECTOR (Central Bank + official banks) (2) | PRIVATE BANKS (net demand deposits) (3) | RATIOS (4)=(3/2) | (5)=(3/1) |
|---|---|---|---|---|---|
| 1970 | 1.5 | 2.7 | 1.5 | 58.5 | 105 |
| 1971 | 2.1 | 2.0 | 1.4 | 71.8 | 70 |
| 1972 | 1.3 | 3.9 | 2.3 | 58.9 | 177 |
| 1973 | 2.5 | 4.4 | 2.5 | 55.6 | 100 |
| 1974 | 1.3 | 2.9 | 1.2 | 41.4 | 93 |
| 1975 | 1.7 | 3.5 | 2.4 | 68.5 | 145 |
| 1976 | 2.6 | 3.6 | 1.3 | 35.5 | 50 |
| 1977 | 2.0 | 3.2 | 1.6 | 49.6 | 79 |
| 1978 | 2.2 | 3.3 | 1.4 | 44.0 | 67 |
| 1979 | 2.8 | 4.5 | 2.1 | 48.1 | 78 |
| 1980 | 2.0 | 3.0 | 1.9 | 63.3 | 96 |
| 1981 | 2.2 | 3.4 | 1.3 | 40.8 | 63 |
| 1982 | 1.9 | 3.0 | 1.6 | 52.2 | 84 |
| 1983 | 1.7 | 2.6 | 1.3 | 49.4 | 78 |
| 1984 | 2.1 | 3.3 | 1.5 | 47.8 | 75 |
| 1985 | 2.0 | 3.6 | 2.2 | 60.9 | 110 |
| 1986 | 3.6 | 6.1 | 3.4 | 55.6 | 95 |
| 1987 | 2.3 | 3.9 | 1.6 | 41.0 | 69 |
| 1988 | 3.2 | 4.6 | 3.5 | 76.9 | 110 |

Source of data: Banco Central do Brasil.[1]

[1] Seigniorage is: $\dot{M} / P = \dot{m} + \pi . m$.
Where the dots refer to the time derivative of the variables; P is the general price level; $\pi$ is the inflation rate; M and m are monies respectively in nominal and real terms. The following concepts of monies were used for calculating seigniorages collected by each type of institution: 1) For Central Bank : monetary base; 2) For official banks: total deposits net of both bank reserves and deposits of the public sector; 3) For private commercial banks: total demand deposits net of bank reserves.

Furthermore the 1990 World Bank Report for Brazil, p. 34, shows that, in terms of GNP, the annualized average inflation tax paid by bank customers in 1985, 1986, and 1987 was 4.3%, 2.2%, and 7.26%, respectively; for the same three years, the Government's annualized average transfer to the banking system was 0.5% of GNP in 1985, 0.3% in 1986, and 1.03% in 1987. The annualized average total tax paid by M1 holders was 7.78%, 4.09%, and 13.9% of GNP respectively.

During recent decades the financing of Brazilian public sector budget deficit was based on the collapsing maturity of the public debt and on the seigniorage collected by the Central Bank. At the same time private commercial banks had, on average, a potential inflation tax rent equivalent to 89% of the seigniorage captured by the Central Bank in the 1970-88 period. While the 1990 World Bank Report for Brazil, p. 37, estimates that the banking sector received about 60% of the annual inflation tax on M1 collected in the 1985-1987 period.

Figures below show how inflation influences the real resources demanded by several banking industries across countries and periods.

In this sense figure 1 below suggests that the Brazilian bank value added as percentage of GNP is positively correlated with inflation. Recently, due to more protective regulation and higher inflation rates, the Brazilian financial system has required more physical resources as a proportion of GNP than, for example, the USA and Germany.

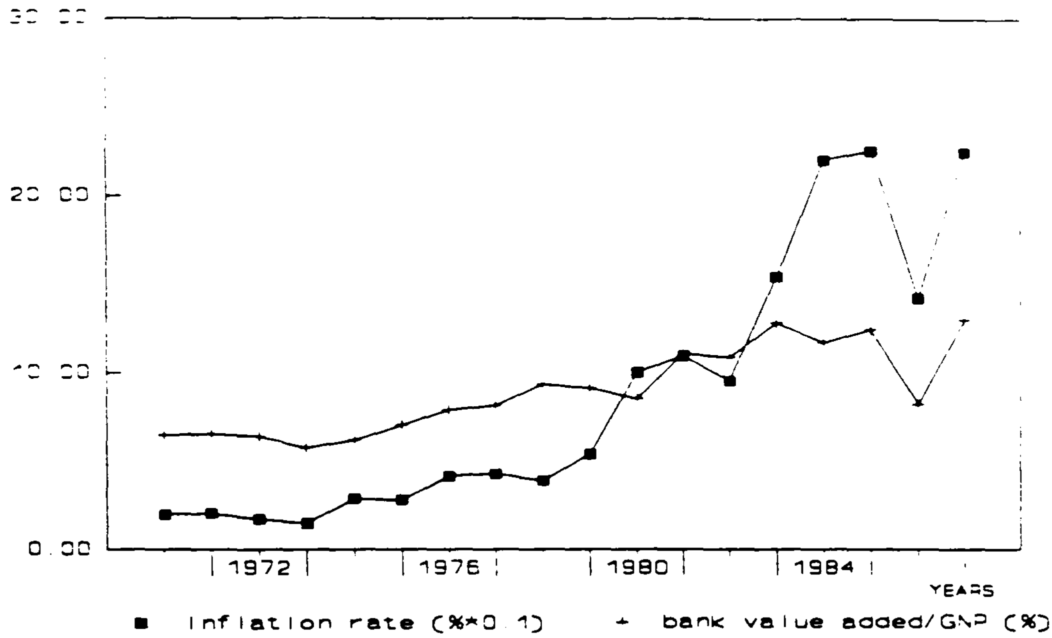


FIG. 1.--BRAZIL: INFLATION & BANK VALUE ADDED

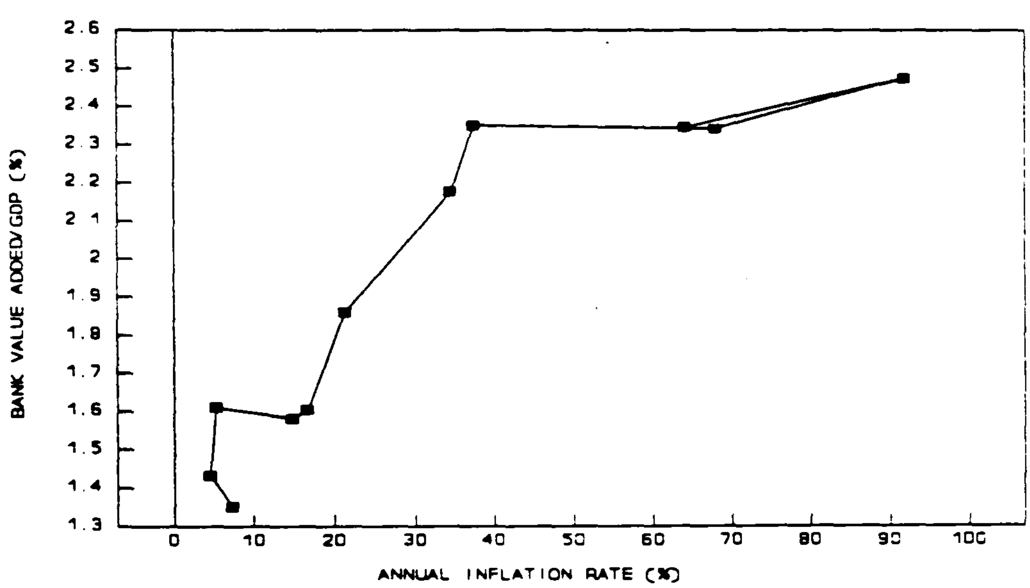


FIG. 2.--INFLATION & BANK VALUE ADDED

BOLIVIA: 1970-80

This excess resource for Brazil relative to these countries has been two to five times greater, implying a difference of 8% of GNP.[2]

Figure 2 above illustrates that for Bolivia also, in the 1970-80 period, when the inflation rate was 9% per year and then reached 100%, the value added by the financial system as percentage of GNP -- to be referred as BKVA from now on -- increased from 1,35% to 2,5%. Similar to the Brazilian case, BKVAs increase with inflation rates. Figure 3 below shows that the same stylized fact applies to Peru. Thus, figures 1-3 suggest that for Bolivia, Brazil, and Peru, the curves between between inflation and BKVA are upward sloping. Therefore, for some highly inflationary economies, inflation rates have been positively correlated with the real resources allocated in the financial sector. This is a first order effect, i.e., in terms of level.

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[2]The value added by kind of economic activity is composed of the value of scarce productive resource -- labor compensation and capital consumption--, operating surplus, and indirect taxes.

I have selected some countries that are reported in the "Yearbook of National Accounts Statistics, National Accounts Statistics: Main Aggregates and Detailed Table," United Nations and "National Accounts," OECD - Department of Economics, for the period 1970-87. The Brazilian bank value added and price level (IGP-DI) are reported by FIBGE - Fundação Instituto Brasileiro de Geografia e Estatística.

Few countries report the value added by the financial institutions, excluding the real estate, insurance companies, dwellings and business services. Most of countries reports the aggregate value added by all these sectors without specifying the financial sector. The countries that report the value added by the financial institutions, show also its cost component, which are: Argentina, Bolivia, Denmark, Finland, Germany, India, Jamaica, Norway, Peru, Sweden, the United States, and Venezuela. The USA provide a long time series dated back from the year 1929. A summary of these data is compiled in "National Income and Product Accounts, Survey of Current Business," United States Department of Commerce/Bureau of Economic Analysis, special supplement, July 1981.

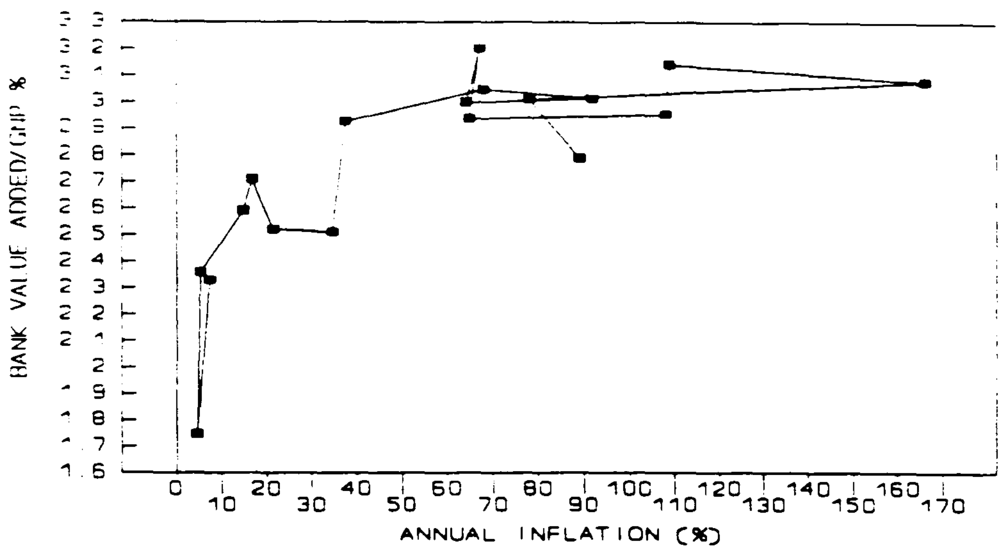


FIG. 3.--INFLATION & BANK VALUE ADDED

PERU: 1970-87

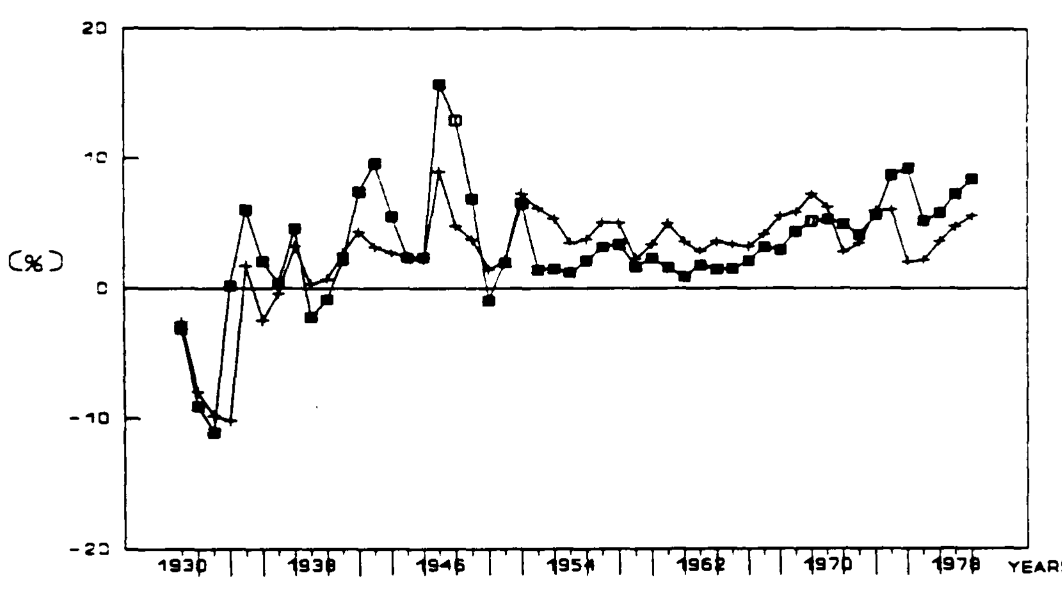


FIG. 4.--USA: INFLATION & BANK LABOR

For the USA, this is a clear second order effect. For instance, in the 1929-79 period, inflation rates have been positively correlated with the growth rate of the American bank employees (see figure 4 above). While figure 5 below illustrates that the American BKVA of 2,1% in the year 1929 is recovered only four decades later. Furthermore the largest drop of the American BKVA was produced during the Great Depression, which can be characterized by an -15% in the growth rate of economy per year, a 10% deflation per year, and a loss of 27% in the banking jobs compared with 21% in the overall labor force.

Similar to the American second order effect of inflation on banking resources, figure 6 below shows that for the German universal banks there is also positive correlation between inflation rates and growth rates in terms of the numbers in bank labor as percentage of total labor force. Therefore, the National Accounts Statistics provide the following stylized facts across countries and periods:

(1) for some developing and unstable economies, e.g., Bolivia, Brazil, and Peru, inflation is positively correlated with bank value added as percentage of GNP. This positive correlation happens also with inflation and bank labor force, in terms of its number or compensation;

(2) for developed economies, e.g., the USA, Germany, Norway, Finland, and Denmark, despite the negative correlation between inflation and bank value added, inflation rates are positively correlated with the growth rates of real variables related to the financial sector; and

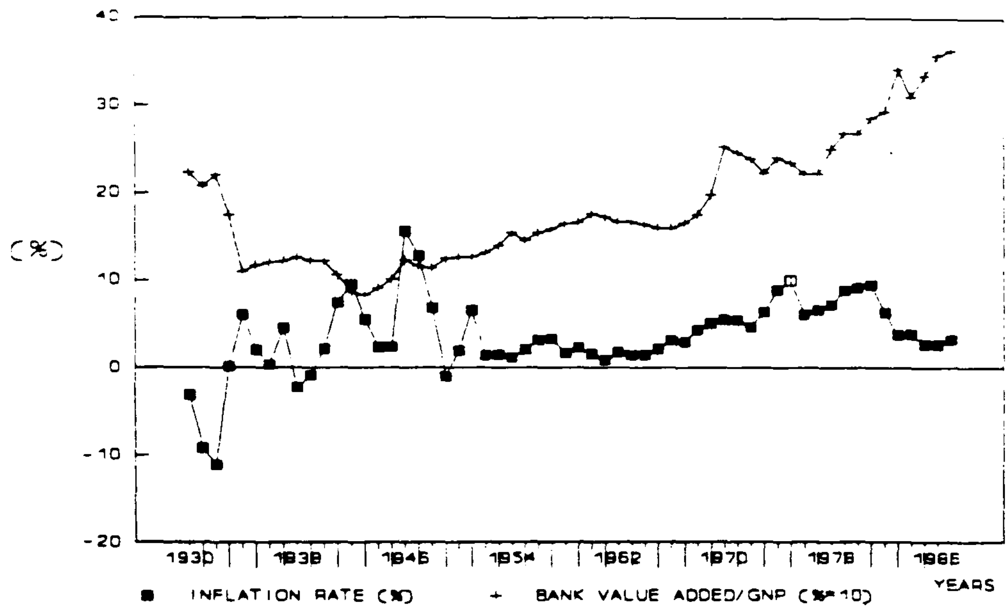


FIG. 5 --USA: INFLATION & BANK VALUE ADDED

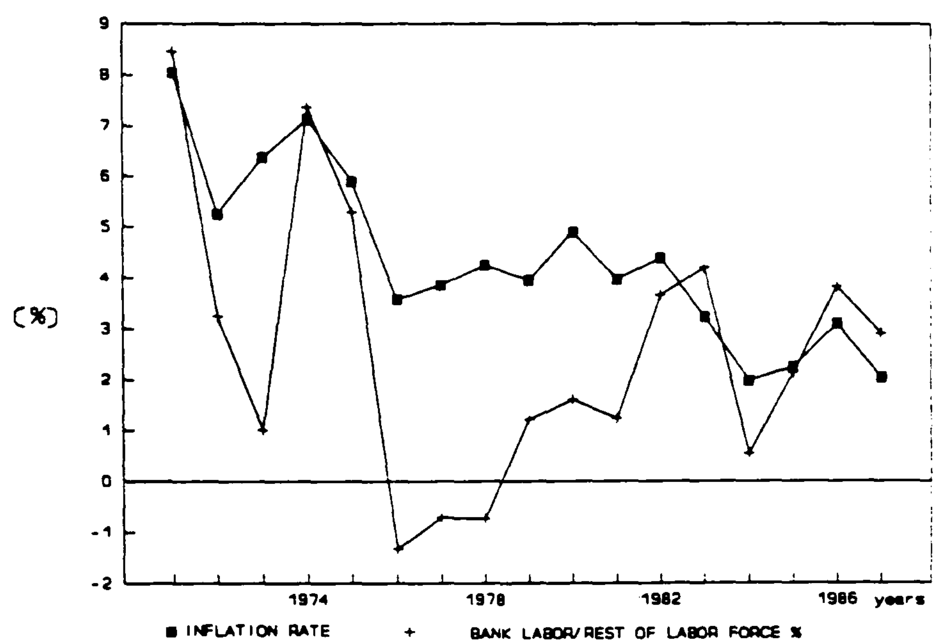


FIG. 6 --GERMANY: INFLATION & BANK LABOR

(3) in some episodes, the real variables may also have affected the bank value added.

Thus, the National Accounts Statistics suggest, at least, that inflation is an important variable affecting the allocation of scarce resources in several financial systems. But what are these displaced resources providing for the whole economy?

On empirical grounds, the National Accounts Statistics give an answer.[3] According to the SNA (System of National Accounts), bank service is imputed as intermediate consumption of the rest of economy. This is done due to the assumption that services render benefits to firms and households.

Considering the methodology adopted by the SNA, available data show how the demand for bank services by the rest of economy influences the real resources allocated in several financial systems. Figures 7 and 8 below suggest that for Bolivia, inflation is positively correlated with the imputed bank service charges as percentage of GNP.

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[3]Given that the SNA (System of National Accounts) make an imputation of bank service charges and subtract them from the gross national output of the whole economy, we are looking into these data.

The SNA consider the gross value of outputs of financial intermediaries as an intermediate consumption of the rest of industries. As it not possible to measure different kinds of bank services provided due to the problem of imputation involved, the SNA have created the concept of nominal industry in order to make use of bank services as intermediate consumption and thus this nominal industry has a negative operating surplus. The SNA make this imputation based on premises that bank service charge does not fully reflect its value. The imputed bank service charge is taken as difference between interest receipts on loans and the interest payments on deposits.

According to the SNA, the total value of bank gross output is measured as its exact service charge plus the imputed bank service charges. Its intermediate consumption is represented by the current expenditure net of factor inputs - compensation for bank labor and capital consumption.

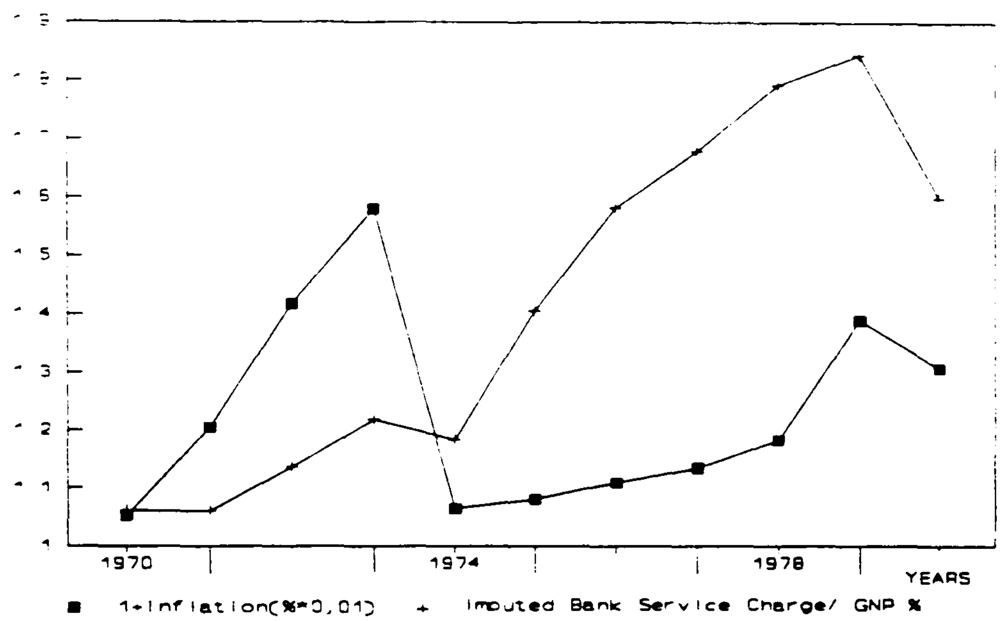


FIG. 7.--BOLIVIA: INFLATION & BANK SERVICE

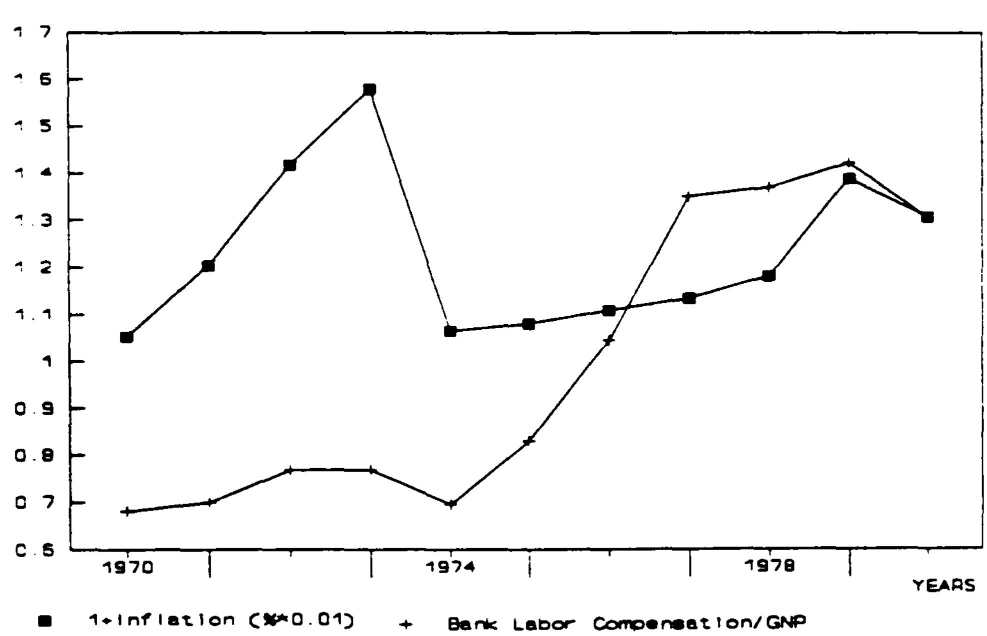


FIG. 8.--BOLIVIA: INFLATION & BANK LABOR

On the other hand, the increased services have induced higher compensation for bank employees as percentage of GNP. A similar phenomenon happens also for Venezuela and Germany (see figures 9 and 10 below).

These stylized facts have described several ways how inflation has displaced the real resources from the rest of economy to the financial sector so as to provide the demanded service. So, figures 1-10 have shown evidence about the non-neutrality of money in terms of the sectorial resource allocation. This aspect has not been considered in the literature, except recently by Lucas (1993).

On theoretical grounds, several monetary models, e.g., Sidrauski (1967), Friedman (1969), McCallum and Goodfriend (1987), and Brock (1989), assume implicitly that bank competes only with interest being paid on deposits and charged on loans. They do not consider the service competition acted by a modern banking system. In particular, Friedman's (1969) marginal costs for providing money are negligible because they do not require real resources. In fact, the provision of cash and deposits does require bank service. More specifically, we neither wake up with the desired money holdings nor do we have a helicopter dropping the demanded real balances into our pockets.

Current financial system provides money by making open-market operations, swapping previous real balances holdings for government bonds, possibly. In this sense, households hire bankers to carry out a portfolio management so as to spend savings on a flow of consumption goods.

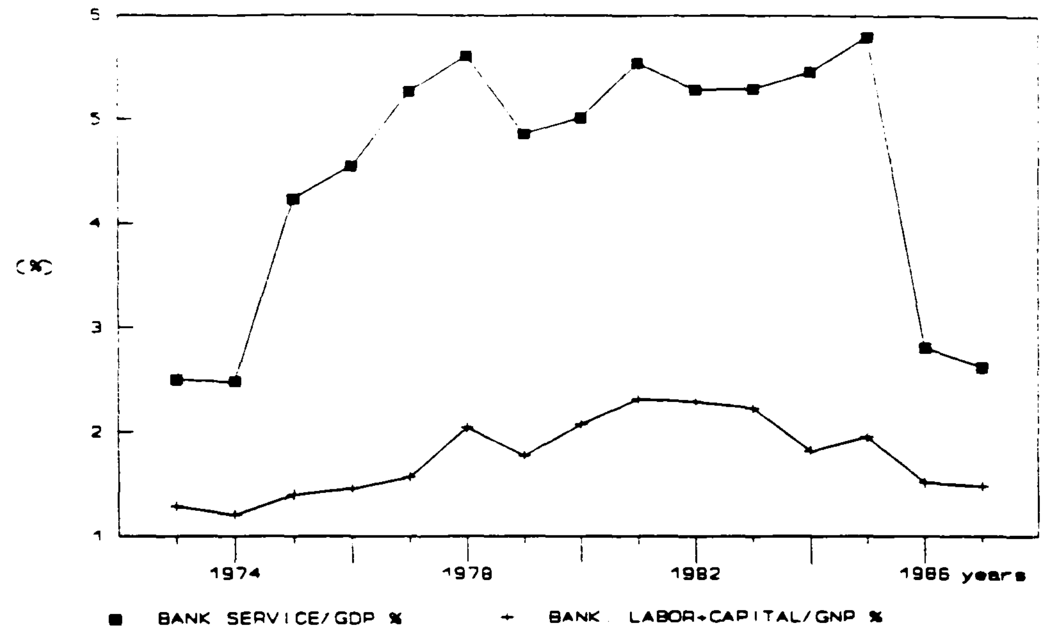


FIG. 9.--VENEZUELA: BANK SERVICE & INPUTS

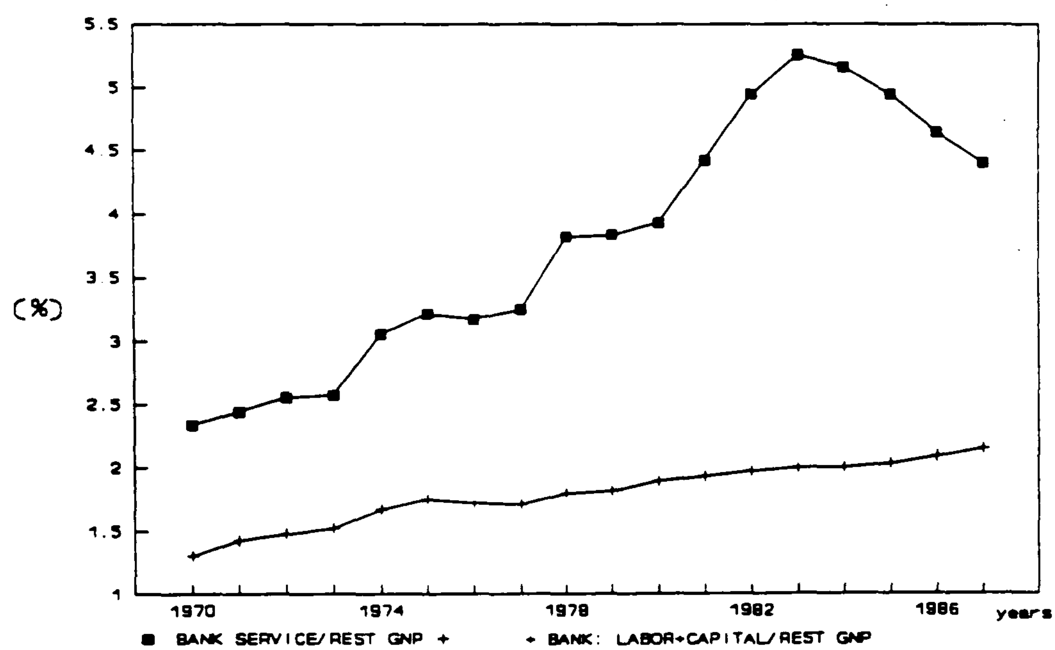


FIG. 10.--GERMANY: BANK SERVICE & INPUT

Thus, households accomplish planned flows of savings and expenditures by making deposits, withdrawing money, and spending bank-trip-time in Baumol's (1952) sense. With this type of monetary arrangement, we analyze the welfare costs of inflation and banking regulation depending on whether banks compete with service, fee, and interest.

The classical optimum quantity of money à la Friedman (1969) has implicitly assumed a banking system that competes only with interest rates. But with service or non-price competition, the required bank labor comes at the expense of alternative uses: hours to produce goods, leisure, and shopping time. The marginal cost of providing deposit is no longer zero. On the other hand, services allow individuals to save time on transactions. Therefore, the issue is also whether the optimal quantity of money does change with banking regulation. Furthermore if a banking system competes only through interest rates, the demand for money schedule reflects the optimal choices of real balances and resources.

In this framework, increased inflation rates causes an aggregate loss of utility, through the reduction of non-interest earning money. This loss represents the welfare costs of inflation tax when the only distortion is the inflationary process itself.

On the other hand, in a transactions-time approach, inflation is a tax on real balances, which are used as inputs for saving shopping time. But a banking regulation that prohibits the payment of interest on deposits, induces non-price competition.

Thus, this regulation magnifies the distortions in the input-market for transactions-time, in addition to the welfare costs of inflation tax. In a financial system that precludes the appropriate pricing of services, an observed stylized fact above has been the resource missallocation between the financial sector and the rest of economy, causing the overbanking phenomenon.

We formalize an unregulated banking system which delivers the optimal quantities of bank service and resource allocated in the financial sector. Thus, there is a possible welfare gain depending on the net marginal benefit of service in addition to the welfare costs of inflation. Furthermore we analyze the deadweight loss of banking regulation that prohibits the payment of interest on deposits -- an extreme version of American regulation Q-- besides the welfare costs of inflation. This framework is an exercise on second best, while the former financial system may deliver Pareto superior allocations.

The welfare costs of inflation in different financial systems compared to Bailey's triangle are also formalized. Thus, the main issue is whether the welfare costs, the marginal benefits of monies, and the marginal costs of financial intermediation, depend on both banking regulation and inflation tax.

This thesis is organized as follow. Chapter II formulates three financial systems. While chapter III proposes methods for evaluating the welfare costs of inflation and banking regulation in these financial systems. Finally, chapter IV presents the conclusions.

# CHAPTER II

## MONEY AND BANKING REGULATION

Our competitive economy is inhabited by a representative agent, who gains utility from consumption goods $c_t$ and leisure $l_t$, over an infinity of periods:

(II.1) $$\sum_{t=0}^{\infty} (1+\rho)^{-t} U(c_t, l_t)$$

Household has a firm for producing consumption goods $c_t$ using labor inputs $n_t$, whose budget constraint is:

(II.2) $$c_t = n_t$$

It is easy to verify that this equation can incorporate the fact that the loans demanded by firms serve the purpose of balancing their cash flow constraints over time.

In this economy, the total time enjoying leisure, spending on transactions, and producing both consumption goods and bank service, sums to one.

(II.3) $$1 = l + \tau + n + \upsilon$$

where $\tau$ is the time spent on transactions and $\upsilon$ is the bank labor for producing service $s(\upsilon)$.

Households use currency $m_t$, deposits $d_t$, bank service $s(\upsilon_t)$, and transaction time $\tau_t$ in order to carry out a spending flow $c_t$:

(II.4) $$\tau_t = c_t F(m_t, d_t, s(\upsilon_t))$$

The transaction technology F( ) represents the average transactions-time spent shopping consumption goods. It is twice differentiable, convex in their arguments, and linear with respect to consumption goods demanded. These types of monies render utility à la Sidrauski (1967) because they allow individuals time saved on transaction:[4]

(II.5) $$(F_m, F_d, F_s) \leq 0$$

(II.6) $$s'(\upsilon) > 0; \quad s''(\upsilon) < 0$$

---

[4]Similar to Walsh (1984), if m, $d$ and s are substitutes in conducting transactions, we have :

$$[F_{mm}, F_{dd}, F_{ss}, F_{md}, F_{ms}, F_{ds}] > 0$$

Furthermore, currency and deposits are arguments of F( ) function because a monetary economy, rather than a barter one, saves transactions-time that otherwise it would be spent for searching on the coincidence of the double wants of goods.

The transaction technology F( ) has known interpretations if bank service $s(\upsilon_t)$ is not argument of this function: (1) exactly McCallum and Goodfriend's (1987) shopping time technology; or (2) Baumol's (1952) bank-trip-time or time cost of portfolio management. In this latter interpretation, $\tau_t$ results from a fixed time (or fee) spent per trip multiplied by the number of trips. Where the number of trips is determined by the ratio of spending flow $c_t$ to the withdrawals of real balances per trip. This reasoning is based on Lucas (1993). Now, bank service becomes another argument of F( ) function because banks can save households' bank-trip-time if a new branch is built nearby their homes than a far away previous one. But the location of branches requires solving a logistic operational research problem.

A solution for this pooling arrangement problem is the so called "home bank," "private bank," or "electronic bank" --without branching--, in which banks offer computer intensive business of mutual fund record keeping and securities custody services. With the aid of this computer system, customers can save time because they are supplied with information about the performance of their portfolios, cash flows, and status of trades via their phones or home computer terminals. Thus, without these bank services, households would have to manage and carry on themselves these tasks.

Another example of pooling arrangement for providing bank service and money, with tax exemption, are the European and Japanese "Giro-banks." This system integrates the mailing receiving, payment, and delivering network with the check clearing and processing in a circular flow, resembling Fama's (1980) banking model.

On the other hand, on conceptual grounds, Lucas (1993) assumes that bank labor and reserves are arguments of the deposit provision, which can be performed, e.g., by the automated teller machines (ATMs). But in condition (II.4), we assume that besides currency and deposits, bank service is another argument of the transaction technology.

Another budget constraint is related to an exogenous government's fiscal deficit $H_t$ which is financed by the Central Bank through a nominal change in the monetary base (currency $M_t$ plus bank reserves $zD_t$):

$$H_t = M_{t+1} + zD_{t+1} - M_t - zD_t$$

and thus,

$$\text{(II.7)} \qquad h_t = (m_{t+1} + zd_{t+1})(1+\Pi_{t+1}) - m_t - zd_t$$

in real terms, where $h_t = H_t/P_t; m_t = M_t/P_t; d_t = D_t/P_t$ and $P_{t+1}/P_t = 1+\Pi_{t+1}$

We define below three types of competitive banking systems: (1) standard; (2) unregulated; and (3) regulated.

# A STANDARD COMPETITIVE BANKING SYSTEM

This model describes McCallum and Goodfriend's (1987) framework. It will be useful to understand the conceptual differences relative to further financial systems.

Monetary Theory, e.g., Sidrauski (1967), Friedman (1969), McCallum and Goodfriend (1987), and Brock (1989), assumes implicitly that banks compete only through interest rates. They do not consider that banks provide services. Thus, the market for deposits can be characterized by a graph. In the vertical axis, the variable is the interest rate paid per deposit. While in the horizontal axis, the variable is the total demand deposits. The supply of deposits by clients is an upward sloping schedule if banks pay higher interest rates per deposit. The demand for deposits by banks is a downward sloping curve if lower interest rates have to be paid per deposit.

With only interest competition, an individual and a bank take, as given, the interest rate paid on deposit. Thus, they choose optimally the amount of deposits. In equilibrium, demand is equal to the supply of deposits, and a coordinate of interest rate and deposit is determined in this graph. The bank's total expenditure is the product of these determined interest rate and deposit. Furthermore, at time t, banks -- as financial intermediaries between households and firms -- receive the principal and the nominal interest rate on loans, and recover the previous non-interest earning bank reserves.

Thus, the budget constraint for a standard competitive bank is:

(II.8) $$E^s_t = (1+i_t)L_{t-1} - (1+i^d_t)D_{t-1} + zD_{t-1}$$

in nominal terms, where $E^s_t$ is bank's profit, $L_{t-1}$ are bank loans, $D_{t-1}$ is the demand deposit received at time t-1, $i_t$ is the nominal interest rate received on loans in the next period, $i^d_t$ is the nominal interest rate paid on deposit, and z is a given reserve ratio.

The market clearing condition in the market for loans requires that the demand is equal to supply. Thus,

(II.9) $$L_{t-1} = (1-z)D_{t-1}$$

Equations (II.8) and (II.9) imply:

(II.10) $$e^s_t = ((1-z)i_t d_{t-1} - i^d_t d_{t-1})/(1+\Pi_t)$$

in real terms, where $e^s_t$ represents the bank's profit in a standard banking system; $e^s_t = E^s_t/P_t$; and $d_{t-1} = D_{t-1}/P_{t-1}$.

In a standard competitive banking system, banks take interest rates as given. Thus, the choice variable is deposit to maximize (II.10). The first order condition for this problem is:

(II.11) $$(1-z)i_t = i^d_t$$

By Walras' Law, the household's budget constraint -- the last one -- is obtained by combining the cash flow constraints of firms, government, and banks. Thus, the consumer's budget constraint in a standard competitive banking system is derived from conditions (II.2), (II.7), and (II.10):

$$c_t^s = n_t + e_t^s - (i_t(1-z) - i_t^d)\, d_{t-1}/(1+\Pi_t)$$

$$+ h_t + m_t + zd_t - (m_{t+1} + zd_{t+1})(1+\Pi_{t+1}) \qquad \text{(II.12)}$$

Given that this type of banking system does not compete with service, the real resource allocated in the financial sector is not a choice variable. So, we set $\upsilon = k$ in condition (II.4); where k is a non-negative constant.

In a standard banking system, households take prices and interest rates as given. Thus, they choose $(c, n, m, d)$ to maximize discounted utility (II.1) subject to constraints (II.3)-(II.4), (II.12) and $\upsilon = k$. Combining the steady state first order conditions for this problem with the bank's first order condition (II.11), imply:

$$\frac{U_l(c,l)}{U_c(c,l)} = \frac{1}{1 + F(m,d,s(k))} \qquad \text{(II.13)}$$

$$- c\, F_m(m,d,s(k)) = i \qquad \text{(II.14)}$$

$$- c\, F_d(m,d,s(k)) = iz \qquad \text{(II.15)}$$

$$1 = l + n + \tau + k \qquad \text{(II.16)}$$

There are six equations, represented by conditions (II.2), (II.4), and (II.13)-(II.16), in variables $(c, l, n, \tau, m, d)$ and for a fixed $\upsilon = k$. Therefore, the system is determined.

The problem of household in a standard competitive banking system is McCallum and Goodfriend's (1987) framework, except the fixed real resources ($\upsilon = k$) in the financial sector.

Condition (II.13) means that the optimal choices of leisure and consumption goods are obtained when their marginal rate of substitution is equated to the shadow price of labor. The shadow price of consumption goods is the market price plus the value of time spent shopping an unit of consumption goods. While condition (II.14) defines the optimum quantity of currency, which is obtained when its marginal benefit, in terms of time saved on transaction due to an additional currency, is equated to its opportunity cost (nominal interest rate, i.e., the steady state tax on currency). On the other hand, condition (II.15) defines the optimum quantity of deposit, i.e., when its marginal benefit is equated to the marginal cost -- steady state opportunity cost of bank reserves.

Therefore, equations (II.13)-(II.16) show that the banking regulation affects both the optimal choices of resource and monies, through changing the market value of shopping time.

Given that the angle of the consumer's budget constraint line changes with banking regulation, the same happens with the level of utility in the space consumption goods-leisure. Thus, the banking regulation is not welfare neutral.

A standard banking system assumes that there is negligible real resource involved ($k \cong 0$), which results in almost zero marginal cost for providing money. It also implies that the nominal interest rate is equal to zero (or deflation is equal to to real interest rate). And Friedman's (1969) optimal quantities of monies render that the nominal interest rate and the marginal utilities of real balances, in currency and deposits, are equal to zero. Thus, his optimum is valid for a standard banking system, when the unique distortion is the inflation tax itself and there is no distortion in the financial intermediation.

## AN UNREGULATED COMPETITIVE BANKING SYSTEM

This banking system is obtained through a deregulation that allows competitive payment of interest on deposits. Furthermore this system provides competitively charged service. Though service is explicitly charged, households demand it due to the consequent time saved on transactions.

To understand the demand for real resources by banks, it is necessary to describe their basic roles. Banks earn incomes from two sources. As financial intermediaries, the main net incomes derive from charging interest on loans and advances given by them, and paying interest on clients' deposits.

Banks render also certain services to their clients, e.g., collection charges in respect of checks, discounting charges for banks drafts, and fee charged on both wire transfer and transaction made on ATMs, etc. But, for some free services, banks input the correspondent charges into interest rates or recover them from the inflation tax rent. But there is another class of service with explicit fee. We first consider this latter type of service here and in the next model, we include the former one.

The banking system to be formalized below is motivated by the American experience. In 1980, US Congress officiated NOW accounts. This financial innovation was initiated by the non-banking financial institutions through paying interest on deposits to circumvent an artificial regulation, which made regulation Q ineffective to protect the banking industry from outside competition.

Furthermore the 1980 DIDMCA (Depository Institutional Deregulation Monetary Control Act) predicted to phased out the ceilings on interest rates until 1986. Later on, the Garn-St Germain Act of 1982 established money market deposit accounts and eliminated several controls on interest rates. Thus, the American banking deregulation has stimulated more interest competition in the market for deposits.

Nowadays, in terms of the US bank services, in particular, the automated teller machines (ATMs) attend one million card holders, with 87.000 units nationwide and 175 networks. One single ATM performs, on average, 5.000 transactions a month and the fees range from fifty cents to one dollar per transaction.

About 600 million transactions take place each month using ATMs. These machines provide not only cash but require a bookkeeping-computer center. Furthermore dozens of companies offer products and services for these complex grids from actual machines to network operations to the processing of transactions. The system relies on computer, skilled labor, satellites, telephone lines, electricity, and terminals (The New York Times, Saturday, March 20, 1993, p. 1 (N)).

Once having in mind that these tasks are also performed by a modern financial system, an "Unregulated Banking System" is designed to incorporate both a explicit fee competition for the provision of service and the previous "Standard Banking System" with interest competition in market for deposits.

The market for service is characterized by a graph, whose variable in the vertical axis is the fee $\psi$ charged per bank service and the variable in the horizontal axis is the total service $s(\upsilon)$. While the supply of service is an upward sloping schedule if the fee $\psi$ per service increases. On the other hand, the demand for service by clients is a downward sloping curve if the fee decreases.

With fee competition, banks and consumers take the price of service as given. Thus, they choose optimally services. In equilibrium, supply is equal to the demand for bank service and a pair of fee $\psi^*$ per unit of service and total bank service $s(\upsilon^*)$ is defined. The consequent total service revenue is $\psi^*\ s(\upsilon^*)$ and the total bank labor expenditure is $W\upsilon^*$ for a constant returns to scale service technology. Therefore, the budget constraint for an unregulated bank, in nominal terms, is:

$$E_t^u = (1+i_t)L_{t-1} + (-(1+i_t^d) + z)D_{t-1} + \psi_t\, s(\upsilon_t) - W_t\upsilon_t$$

where $E_t^u$ is the bank's profit. The superscript "u" refers to an "Unregulated Competitive Banking System."

The equation above and the equilibrium in the market for loans, which is given by equation (II.9), imply:

$$\text{(II.17)} \qquad e_t^u = ((1-z)i_t - i_t^d)d_{t-1}/(1+\Pi_t) + \phi_t\, s(\upsilon_t) - \upsilon_t$$

in real terms, where $e_t^u = E_t^u/P_t; d_{t-1} = D_{t-1}/P_{t-1}; \phi_t = \psi_t/P_t; 1 = W_t/P_t$

Since an unregulated bank competes with both interest and fee, they are taken as given. Thus, the choice variables are both demand deposits and bank labor so as to maximize (II.17). The first order conditions for this problem are:

$$\text{(II.18)} \qquad (1-z)i_t = i_t^d$$

$$\text{(II.19)} \qquad \phi_{t-1}s'(\upsilon_{t-1}) = 1$$

Again, by Walras' Law, combining the budget constraints given by conditions (II.2), (II.7), and (II.17), we obtain the consumer's budget constraint in an unregulated banking system:

$$c^u_t = n_t - (i_t(1-z) - i^d_t)d_{t-1}/(1+\Pi_t) - \phi_t\ s(\upsilon_t) + \tau_t$$

$$\text{(II.20)} \qquad + h_t + m_t + zd_t - (m_{t+1} + zd_{t+1})(1+\Pi_{t+1})$$

where $c^u_t$ represents the consumption level in an unregulated banking system at time t.

In this banking system, households take, as given, prices, fee, and interest. Thus, they choose $(c, n, \upsilon, m, d)$ so as to maximize the discounted utility (II.1) subject to the constraints (II.3), (II.4), and (II.20). Combining the steady state first order conditions for this problem with the unregulated bank's first order conditions (II.18)-(II.19), render:

$$\text{(II.21)} \qquad \frac{U_l(c, l)}{U_c(c, l)} = \frac{1}{1 + F(m, d, s(\upsilon))}$$

$$\text{(II.22)} \qquad -c\ F_m(m, d, s(\upsilon)) = i$$

$$\text{(II.23)} \qquad -c\ F_d(m, d, s(\upsilon)) = iz$$

$$\text{(II.24-A)} \qquad -c\ F_s(m, d, s(\upsilon))\ s'(\upsilon) = 1$$

$$\text{(II.24-B)} \qquad -c\ F_s(m, d, s(\upsilon)) = \phi$$

where $(1-z)i = i^d$ and $\phi\ s'(\upsilon) = 1$, according to the bank's steady state first order conditions (II.18)-(II.19).

There are seven equations represented by conditions (II.2)-(II.4) and (II.21)-(II.24), in variables (c,l,n,r,m,d,v). Therefore, the system is determined.

Condition (II.21) means that the optimal choices of leisure and consumption goods are obtained when their marginal rate of substitution is equated to the shadow price of labor. The shadow price of consumption goods is the market price plus the value of time shopping an unit of consumption goods. Now, the shopping time F( ) has changed compared with the previous case due to the optimum choice of bank labor.

Equation (II.22) defines the optimum quantity of currency, which is obtained when its marginal benefit -- the market value of time saved on transaction due to an additional currency--, is equated to the nominal interest rate, which is its opportunity cost. While condition (II.23) defines the optimum quantity of demand deposit, when its marginal benefit is equated to the marginal cost, i.e., the steady state opportunity cost of bank reserves.

Equation (II.24-A) says that a representative agent allocates, on the margin, additional hour in an unregulated banking industry when the consequent market value of the marginal time saved on transactions is equated to its opportunity cost: the value of time for producing consumption goods. While condition (II.24-B) means that households demand, on the margin, additional bank service so as to the consequent market value of marginal time saved on transactions is equated to the fee charged on service.

Therefore conditions (II.24-A)-(II.24-B) define a Pareto superior allocation for bank service and labor compared with the standard banking system above, in which bank labor was not a choice variable. It was fixed. This result implies that the level of utility has changed with banking regulation, according to equations (II.13) and (II.21). We will return to this aspect, later, when we analyze the welfare costs of inflation and banking regulation.

## A REGULATED COMPETITIVE BANKING SYSTEM

This banking system is obtained by imposing some specific rules to the operation of a financial system, in particular, the prohibition of interest payment on deposits induces non-price or service competition. Now, the competition is with service than fee. This prohibition is an extreme version of previous American regulation Q --interest ceiling in the market for deposits--, which still is enforced in most of the Latin American and European countries.

In this environment, banks attract non-interest paid deposits by offering free services to their clients. On the other hand, services allow households time saved on transactions. The commercial banks enjoy this regulation because they can capture the potential inflation tax rent on net non-interest paid deposits through making loans at competitive interest rates to the firms and incurring bank labor costs.

In this sense the 1990 World Bank Report for Brazil, p. 31, states that:

> When banks are barred from paying interest on demand deposits they will engage in non-price competition which implies the use of resources to expand branches and other mechanisms to compensate lenders. From a social point of view, the result is overinvestment in the financial sector. Rent-seeking behavior will also lead to over-branching and resource missallocation. Many of the distortionary effects of inflation on resource allocation are reduced when banks are allowed to engage in price competition.

The model below is motivated by the Brazilian banking experience described above, in terms of non-price competition. Just like interest competition in a standard banking system above, the market for deposits is characterized by a graph whose variable in the vertical axis is the non-charged bank service $s(u_t)$ per deposit rather than interest paid per deposit in the previous case. The variable in the horizontal axis is still deposit. The supply of deposits by the bank's clients is an upward sloping schedule if they receive more service per deposit.

On the other hand, the demand for deposits by banks is represented by a downward sloping curve if less service per deposit has to be provided to clients, which implies cost saving in terms of less compensation for bank labor per deposit.

In a regulated banking system, banks and clients take service (or bank labor) per deposit as given and they choose optimally deposits. In equilibrium, supply is equal to demand, and a pair of service per deposit $s(u^*)$ and the total amount of deposits $d^*$ is determined in this graph. Since service $s(u^*)$ per deposit requires $u^*$ bank labor per deposit for a constant returns to scale service production technology, the total bank labor $\upsilon^*$ is equal to $u^*d^*$ and the total bank labor cost is $u^*d^*$, in real terms.

In terms of the budget constraint, on the expenditure side, the provision of bank service results in a compensation for labor. On the interest revenue side, still there is a competitive market for loans. Thus, the budget constraint for a regulated bank is:

$$E^r_t = (1-z)i_t D_{t-1} - (1+i_t) u_{t-1}D_{t-1}$$

in nominal terms, and

(II.25) $$e^r_t = (1-z)i_t d_{t-1}/(1+\Pi_t) - (1+r)u_{t-1}d_{t-1}$$

in real terms.

A particular bank takes, as given, the level of service per unit of deposit $s(u^*)$. The choice variable is demand deposit so as to maximize the discounted values of profits, which are defined by condition (II.25). The first order condition for this problem is:

$$(1-z)i_t = (1+i_t)\, u_{t-1} \tag{II.26}$$

By Walras' Law, the consumer's budget constraint in a regulated banking system is obtained by combining the cash flow constraints (II.2), (II.7), and (II.25):

$$c_t^r = n_t - i_t(1-z)d_{t-1}/(1+\Pi_t) + (1+r)u_{t-1}d_{t-1}$$

$$+ h_t + m_t + zd_t - (m_{t+1} + zd_{t+1})(1 + \Pi_{t+1}) \tag{II.27}$$

In a regulated banking system, households take, as given, prices, interest, and service (or bank employee u) per unit of deposit. Thus, they choose $(c,n,m,d)$ to maximize discounted utility (II.1) subject to constraints (II.3), (II.4), and (II.27). It should be noted that $v$ is replaced by $ud$ in condition (II.3). Thus,

$$1 = l + n + ud + \tau \tag{II.28}$$

and condition (II.4) becomes:

$$\tau_t = c_t\, F(m_t, d_t, s(u_t d_t)) \tag{II.29}$$

Combining the steady state first order conditions for this problem with the bank's first order condition (II.26), imply:

$$\text{(II.30)} \qquad \frac{U_l(c,l)}{U_c(c,l)} = \frac{1}{1 + F(m,d,s(ud))}$$

$$\text{(II.31)} \qquad - c\,F_m(m,d,s(ud)) = i$$

$$\text{(II.32-A)} \qquad - c\,F_d(m,d,s(ud)) - c\,F_s(m,d,s(ud))\,s'(\upsilon)u = i$$

$$\text{(II.32-B)} \qquad - cF_s(m,d,s(ud))s'(\upsilon) - cF_d(m,d,s(ud))d/\upsilon = 1/(1-z)$$

where $i(1-z) = u$, since $u > 0 \Rightarrow i > 0$, according to the steady state continuous version of condition (II.26).

Conditions (II.2) and (II.28)-(II.32-A) define six equations in variables $(c,l,n,\tau,m,d)$. Therefore, the system is determined.

Condition (II.30) means that the optimal choices of leisure and consumption goods are obtained when their marginal rate of substitution is equated to the shadow price of labor. The shadow price of consumption goods is the market price plus the value of time shopping an unit of consumption goods. While condition (II.31) defines the optimum quantity of currency, which is obtained when its marginal benefit -- the market value of time saved on transaction due to an additional currency--, is equated to its opportunity cost (nominal interest rate). Equation (II.32-A) shows the optimum choice of deposit.

Since bank labor per deposit $u_t$ is taken as given, the optimal total bank employees $u_t d_t$ or service $s(u_t d_t)$ are indirectly determined according to equation (II.32-B). These equations are same, in particular, their left-hand sides define two marginal benefits of additional deposit in terms of time saved on transactions: a direct one through deposit $F_d$ and an indirect one through time saved due to the additional service $F_s s'(\upsilon d)u$ obtained in exchange for non-interest earning deposit. The right-hand side of this equation defines the total marginal cost of additional deposit in terms of the nominal interest rate foregone on non-interest earning deposit, which is composed of the opportunity costs of both bank reserves and scarce resource, which is used to provide free service per deposit.

In the next chapter, we compare the financial systems formulated above in terms of the welfare analysis.

CHAPTER III

# ON THE WELFARE COSTS OF INFLATION AND BANKING REGULATION

It was shown above that the banking regulation affects the marginal benefits of both real balances and resource allocated in the banking industry and thus, their optimal quantities. For instance, Bailey (1956) has implicitly assumed no distortions in the financial market, except the anticipated inflation tax.

We formalize below how the banking regulation adds up deadweight costs or welfare gains to the triangle under the demand for monetary base schedule. Furthermore, for which banking system is it suitable to consider Bailey's triangle as an appropriate measure of the welfare costs of inflation?

In order to define the welfare costs of inflation and banking regulation, we start from the indirect utility function for each banking system formulated above. From the steady state continuous first order conditions obtained for the household's problem in a standard banking system, the total differential of indirect utility, and the envelope theorem imply:

(III.1) $$\frac{d\,U^{s}}{\mu} = (m+zd)\,di + (1-z)d\,di - d\,di^{d} - dh$$

Assuming that the marginal utility of total expenditure $\mu$ is constant (or with homothetic preferences), we can integrate utility changes over the interval $(i_0, i_0^d)$ to $(i_1, i_1^d)$ to give the total welfare change as $\mu$ times the area under the demands for real balances, in currency and deposits, as functions of the nominal interest rates. Thus, the condition above becomes:

$$\text{(III.2)} \qquad W^s = \int \frac{d\,U^s}{\mu} = \int_{i_0}^{i_1} (m+zd)\ di + \int_{i_0}^{i_1} (1-z)\ d\ di -$$

$$- \int_{i_0^d}^{i_1^d} d\ di^d - h\Big|_{h_0}^{h_1}$$

where $h = i(m+zd)$

Using the first order condition (II.11), i.e., $(1-z)i = i^d$, equation above implies:

$$\text{(III.3-A)} \qquad W^s = \int_{i_0}^{i_1} (m+zd)\ di - h\Big|_{h_0}^{h_1}$$

In a similar way, considering the Marshallian approach, from the first order conditions for the household's utility maximization problem in a standard banking system, we make the total differential of the utility.

Again, if $\mu$ is constant and defining the nominal interest rate expressed as function of the real balances, then we can integrate utility changes over the interval $(m_0, d_0)$ to $(m_1, d_1)$ to give the total welfare changes as $\mu$ times the areas under the Marshallian demands for currency and bank reserves. Thus,

$$(III.3\text{-}B) \qquad W^s = \int_{m_0}^{m_1} i \, dm + \int_{d_0}^{d_1} iz \, dd$$

In standard banking system, conditions (III.3-A)-(III.3-B) above define the welfare costs of inflation, which are measured by the areas under demands for real balances schedules. Furthermore conditions (III.2)-(III.3-A) show that the distortions caused by the inflation tax in the market for loans is cancel by the gain in the market for interest paid deposits.

The welfare costs of anticipated inflation in a standard banking system arise from the nonpayment of interest on monetary base and the government having non-distorting lump-sum taxes available. All costs are evaluated compared with an undistorted zero nominal interest rate produced by Friedman's optimum quantity of money.

Indeed, the triangles above are not Bailey's (1956) welfare costs of inflation if it is interpreted that he has considered the area under the Marshallian demand for M1 schedule rather than the monetary base. This doubt arises because Bailey (1956) has not formalized the derived demand for money. He has just sketched a graph.

Furthermore which type of financial system did Bailey have in mind to justify his choice of the relevant monetary aggregate for assessing the welfare costs of inflation?

It is embarrassing to address this fundamental issue in "Money & Banking" thirty-seven years after Bailey (1956) has proposed his famous methodology for estimating the welfare costs of anticipated inflation. In this sense, we have returned to this subject to show that banking regulation has an important role for choosing the appropriate concept of "money" to evaluate the welfare costs of distorting inflation tax and obtain an effective monetary policy.

Using the same methodology above, from the steady state continuous first order conditions for the household's problem in an unregulated banking system, the total differentials of both the indirect utility and the usual utility function -- it has as arguments the Marshallian demands for consumption goods and leisure--, and the envelope theorem, on integration, imply the following equivalent equations:

$$\text{(III.4-A)} \qquad W^u = \int_{i_0}^{i_1} (m+zd)\,di - h\Big|_{i_0}^{i_1} + \int_{\phi_0}^{\phi_1} s(\upsilon)\, d\phi$$

(III.4-B)

$$W^{u} = \int \frac{d\,U^{u}}{\beta} - \int_{m_{0}}^{m_{1}} i\,dm + \int_{d_{0}}^{d_{1}} iz\,dd + \int_{\upsilon_{0}}^{\upsilon_{1}} \left( -cF_{s}[m,d,s(\upsilon)]s'(\upsilon) - 1 \right) d\upsilon$$

In an unregulated banking system, there is a welfare gain relative to the welfare costs of inflation. This gain is represented by the last integral term on the right-hand side of condition (III.4-A) above, which is measured by the area under Hicksian demand for bank service. This gain is also given by the last integral term on the right-hand side of equation (III.4-B), which is evaluated by the area under the Marshallian demand for (or marginal benefits of) bank service net of its consequent marginal cost.

Comparisons of conditions (III.2)-(III.3) with (III.4) show that the fee and interest competitions in an unregulated banking system can deliver a welfare improvement due to the adequate pricing mechanism vis-à-vis a standard banking system with no fee competition -- only interest competition. So, an unregulated banking system can render Pareto superior solutions.

Using again the same methodology above, but for a regulated banking system, we obtain:

(III.5-A)

$$W^r = \int_{i_0}^{i_1} (m+zd)\, di - i(m+zd)\Big|_{i_0}^{i_1} + \int_{i_0}^{i_1} (1-z)d\, di + \int_{u_0}^{u_1} cF_s[m,d,s(\upsilon)]s'(ud)d\, du$$

(III.5-B)

$$W^r = \int_{i_0}^{i_1} (m+d)\, di - i(m+zd)\Big|_{i_0}^{i_1} + \int_{u_0}^{u_1} cF_s[m,d,s(\upsilon)]s'(ud)d\, du$$

(III.5-C)

$$W^r = \int_{i_0}^{i_1} (m+zd)di - i(m+zd)\Big|_{i_0}^{i_1} + \int_{u_0}^{u_1} (1+cF_s[m,d,s(\upsilon)]s'(\upsilon))d\, du$$

(III.5-D)

$$W^r = \int_{m_0}^{m_1} i(m)\, dm + \int_{d_0}^{d_1} i(d)\, dd + \int_{\upsilon_0}^{\upsilon_1} [-c\, F_s(m,d,s(\upsilon))s'(\upsilon) - 1]\, d\upsilon + \int_{d_0}^{d_1} [-c\, F_d(m,d,s(\upsilon)) - i]\, dd$$

Equations (III.5-A)-(III.5-C) are derived by using the indirect utility function, while condition (III.5-D) is based on the usual utility, which has as arguments the Marshallian demands for consumption goods and leisure. In particular, condition (III.5-B) above shows that the total welfare costs in a regulated banking system is composed of the welfare costs of inflation -- evaluated by the area under the Hicksian demand for M1, in real terms--, minus both the change in seigniorage with inflation and the time saved on transactions due to the benefit of excess service generated by a regulated bank compared with an unregulated one. Therefore, the optimal quantities derived in the former banking system are, indeed, second best solutions.

Condition (III.5-C) above shows also that the total welfare costs in a regulated banking system is composed of: (a) the welfare costs of inflation -- measured by the area under the Hicksian demand for monetary base, in real terms; and (b) the welfare costs of the resource missallocation, which is evaluated by the triangle under the Hicksian demand for service net of its marginal cost.

Alternatively, condition (III.5-D) above shows that the total welfare costs in a regulated banking system have the following terms:

(1) the welfare costs of inflation -- measured by the triangles under the Marshallian demands for each component of M1 (currency and demand deposits);

(2) the welfare cost of the resource missallocation compared with the optimum unregulated one. This cost is evaluated by the area under the Marshallian demand for service schedule net of the marginal cost;

(3) the welfare cost in the market for deposits compared with the optimal unregulated one. This cost is measured by the area under the Marshallian schedule for the direct marginal benefit of deposit in saving time on transactions $-c\ F_d(m,d,s(\upsilon))$ net of the opportunity cost of holding non-interest earning deposit -- nominal interest rate.

Equation (III.5-D) shows also that due to the banking regulation there is no reason to measure the welfare costs of anticipated inflation under the "aggregate" demand for money schedule because currency and deposits may not be perfect substitutes anymore due the the different marginal costs. It is more suitable to measure the welfare costs separately for each component of the monetary aggregate. This result implies also that the banking regulation, specially, with interest ceiling, affects the monetary policy. Thus, the banking regulation does matter for the quantitative control of monetary aggregate.

We guess that Bailey had in mind a monetary system in which there was no distinction between currency and deposits. Thus, his M1 bears fully the inflation tax. It also happens with one hundred percent reserves (M1 is equal to monetary base, i.e., no banking industry). This unique arrangement exists in Cape Verde, where the Central Bank performs the role of Monetary Authority, development bank, and commercial bank.

Therefore, the sum of the triangles under the Marshallian demands for each component of M1 is the upper bound for the welfare costs of inflation in the worst banking system -- regulated. While the lower bound for the welfare costs of inflation is the triangle under the demand for monetary base, which is valid for both the standard and unregulated financial systems. But the banking regulation causes additional distortions, which make a range on the welfare costs of inflation. An unregulated bank can attenuate the welfare costs of inflation -- according to condition (III.4-B)--, while the non-price competition imposes additional deadweight cost (see condition III.5-C).

In this sense, the optimal quantities derived in a regulated banking system are second best because the banking regulation causes additional distortions on the welfare costs of anticipated inflation tax. While the optimal quantities in an unregulated banking system are first best.

The welfare costs or gain of banking regulation, besides the welfare costs of inflation, should be evaluated under: (a) the demand for service schedule net of the marginal cost of resource involved; and (b) the demand for deposits schedule net of their opportunity costs. These evaluations are made relative to the undistorted first best solutions in an unregulated banking system.

Figures 11 and 12 below illustrate these Harberger's (1971) triangles in the markets for both deposits and service in different financial systems.

The reason for considering the areas under the demands for bank service and real balances for evaluating the welfare costs of inflation and banking regulation becomes clear by considering Wisecarver (1974), pp. 12 and 17:

> Any utility that might be attributed to the area under the factor's demand curve is necessarily a mere reflection of utility that its services ultimately provide. The utility garnered by the ultimate purchasers of the product of a factor's service is reflected in the demand curve for that factor. Furthermore, it is incorrect to calculate utility losses in both input and output markets when only input is explicitly taxed. Therefore, the factor-market measure of social cost is correct and complete and the all input-market measure is true deadweight cost.

In this sense, based on the "product-market approach," conditions (II.13), (II.21), and (II.30) show that the change in utility is caused by the different marginal rates of substitution between consumption goods and leisure in each banking system, i.e., the condition $U_l/U_c(c,l) = 1/[1+F(m,d,s(\upsilon))]$. These marginal rates are equated, on the margin, to the shadow price of real wage. In another words, the angle of the consumer's budget constraint line in the space consumption goods-leisure changes with inflation and banking regulation.

On the other hand, according to "the input-market approach," these shadow prices of real wages are affected by the market values of the average time spent on transactions per goods $\tau/c = F(m,d,s(\upsilon))$.

Therefore, using Wisecarver's "factor-market approach" for analyzing Harberger's triangles under the demands for both bank service and real balances, in currency and deposits, is equivalent to verify the change in utility in the space consumption goods-leisure. In particular, Lucas (1993), section five, contains this latter approach because he has solved for the consumption flow as a function of the nominal interest rate. This framework has the advantage for understanding the correlation between bank value added and inflation. Now, we return to "factor-market approach" to illustrate the welfare costs of inflation and banking regulation derived above.

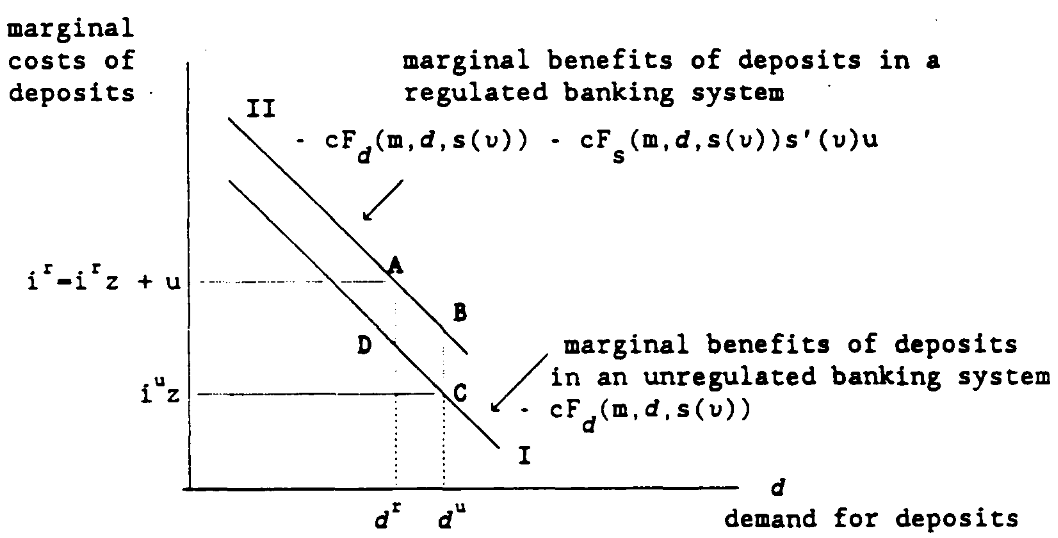


Fig. 11. -- The demand for deposits in unregulated and regulated banking systems.

Curve I above shows the demand for deposits schedule in an unregulated banking system, according to condition (II.23). While curve II represents the demand for deposits schedule in a regulated banking system, which is stated by condition (II.32-A). These curves are downward sloping due to the properties of F( ) function.

The marginal costs of deposits, the variable in the vertical axis, are defined respectively by conditions (II.18) and (II.26). In the figure above, the nominal interest rates $i^u$ and $i^*$ are same and they are equal to zero. While the nominal interest rate $i^r$ is equal to u/(1-z), which is positive due to the non-negative banking labor u.

Figure above illustrates that depending on banking regulation and the consequent interest, fee, or non-price competitions, the optimal quantities of deposits do change. In particular, the area given by the points A-B-C-D illustrates the partial welfare loss in the market for deposits in a regulated banking system compared with an unregulated one. This area is represented the last integral term on the right-hand side of equation (III.5-D).

Figure 12 below illustrates the welfare costs of banking regulation, which is measured partially by the demand for service schedule.

Curve I, in figure below, represents the marginal benefit of bank service in an unregulated banking system (see condition II.24-A). While curve II shows this marginal benefit in a regulated banking system, which is defined by condition (II.32-B). These curves are downward sloping due to the properties of F( ) function.

The superscripts for bank labor in the horizontal axis refer to each type of banking system: $\upsilon^s = k \geq 0$ is relative to a standard banking system; $\upsilon^u$ is the optimum bank labor in an unregulated banking system, and $\upsilon^r$ is related to the regulated one.

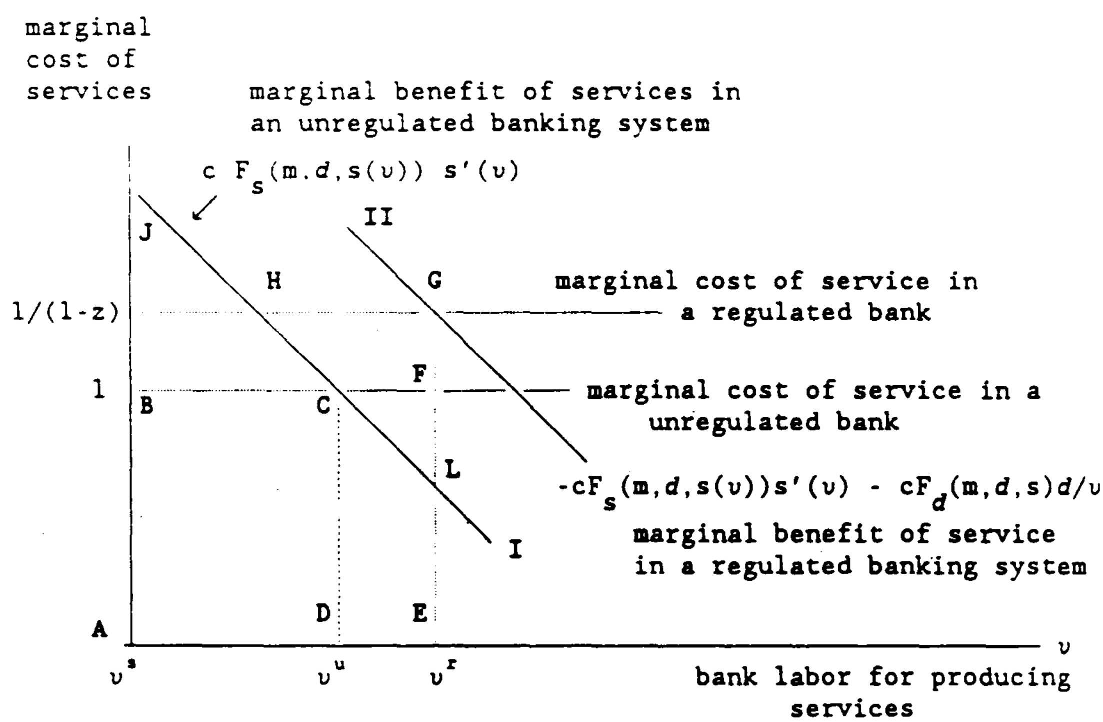


Fig. 12. -- The deadweight costs of banking regulation in the market for service.

In the figure above, point C represents the optimum choice of service in an unregulated banking system (see condition II.24-A). While point G refers to a regulated one (see condition II.32-B). On the other hand, point J is about a standard banking system, which is defined by coordinates $[\upsilon^s = k; -cF_s(m,d,s(k))s'(k)]$.

The welfare gain or deadweight costs of the banking regulation in the market for services can be illustrated by comparing these points. In an unregulated case, the marginal benefit of service or bank labor is equated to its opportunity cost: value of an unit of time for producing goods (see condition II.24-A). This Pareto superior condition is not obtained in any other banking system considered here. Area J-B-C in the figure above is exactly the third integral term on the right-hand side of equation (III.4-B). It shows a possible welfare gain in an unregulated banking system with both interest and fee competitions compared with the standard case (only interest competition).

Given that service is invariant in a standard banking system, it does not allow the welfare improvement that may result from the technological progress in the provision of service. On the other hand, the triangle given by the points C-F-L in the figure 12 above shows the welfare costs of resource missallocation in a regulated banking system compared with an unregulated one. This triangle is exactly the third integral term on right-hand side of condition (III.5-D).

The welfare costs defined above should be measured compared with the prices, interests, and the optimal allocations, obtained in an unregulated banking system, which are characterized by a zero nominal interest rate and the optimum resource $\upsilon^u$. So, an unregulated banking system can bring about Pareto superior allocations for bank service and resource compared with the standard and regulated cases.

In a financial system that competes through all prices --interest and fee--, and not on service, on the margin, the optimal quantities of currency and deposits produce a zero nominal interest rate, but their total quantities have changed because part of these monies have been substituted away by the Pareto superior bank service so as to save time on transactions.

CHAPTER IV

# CONCLUSIONS

The measurement of the welfare costs of inflation by the area under the Marshallian demand for monetary base, in real terms, is valid for a financial system that competes only with interest. In this banking system, the welfare costs of anticipated inflation arise from the nonpayment of interest on monetary base and the government having non-distorting lump-sum taxes available. These costs are evaluated compared with an undistorted zero nominal interest rate produced by Friedman's optimum quantity of money.

In this framework, the monetary base is an appropriate monetary aggregate for evaluating the welfare costs of inflation because, in terms of the components, the reduction of currency, in real terms, represents the loss of utility due to inflation. Also, deposits net of reserves, which are equal to loans, do generate a welfare loss in the market for loans. This loss is offset by the welfare gain in the market for interest earning deposits. Thus, in terms of deposits, the net welfare costs of inflation can be evaluated by considering the non-interest earning bank reserves. Therefore, the total welfare loss in a financial system that competes only with interest is given by the area under the demand for monetary base schedule.

This result is no longer valid depending on banking regulation and the consequent types of competitions in the market for deposits. Thus, there is welfare gain or deadweight loss beyond the triangle under the demand for monetary base schedule. Furthermore, the concept of relevant money for evaluating the welfare costs of inflation does change due to the welfare costs of banking regulation. In this sense, in a financial system that competes with both interest and fee charged on services there is a possible welfare gain vis-à-vis another system that competes only with interest. This gain is measured by: (a) the area under the Marshallian demand for bank service net of its consequent marginal cost; or (b) the area under the Hicksian or compensated demand for bank service.

In this financial system, the marginal benefit of service or bank labor is equated to its opportunity cost, in terms of an unit of time that otherwise it would be used for producing consumption goods. This Pareto superior condition is not obtained in any other banking system. Thus, the welfare improvement is made possible by an adequate pricing mechanism compared with a system with no fee competition -- only interest competition. In this sense, the former system can deliver Pareto superior allocations. On the other hand, with service or non-price competition in the market for deposits, which is induced by interest ceiling, produces the resource missallocation in the financial sector vis-à-vis the rest of economy. This outcome implies additional distortion on the welfare costs of inflation. Therefore, the optimal quantities derived in this banking system are, indeed, second best.

The service competition allows bank to capture the inflation tax rent on non-interest paid deposits. This type of competition does not permit the pricing mechanism to allocate efficiently the resource involved. But with both fee and interest competitions in the market for deposits can avoid this missallocation.

A financial system that does not compete with bank service charges, but only with interest, by assumption, there is no choice of resource for producing bank service. This framework is usually assumed in the Monetary Theory.

On the other hand, a financial system that does competes with all prices as described above, on the margin, the optimal quantities of currency and deposits produce a zero nominal interest rate, but their total quantities do change because part of these monies have been substituted away by the optimum bank service so as to save transactions-time.

Once having in mind that different financial systems produce additional welfare loss or gain beyond the triangle under the demand for monetary base schedule, one should be aware of the distortion caused by the banking regulation for evaluating appropriately the total welfare costs. For instance, in financial systems with the nonpayment of interest on deposits, which happens in most of the Latin American and European countries, an appropriate measure of the total welfare costs is composed of:

(a) the welfare costs of inflation -- evaluated by the area under the demand for monetary base schedule, in real terms; and

(b) the welfare cost of the real resource missallocation in the financial system. This cost is measured by the triangle under the Hicksian demand for service net of its marginal cost.

Alternatively, the total welfare costs in a financial system that compete with service (or non-price competition) is composed of:

(a) the welfare costs of inflation. These costs are evaluated by the sum of the triangles under the Marshallian demands for each component of M1, in real terms. In this case, currency and deposits are not perfect substitutes anymore--, as opposed to Bailey's triangle under the "aggregate" demand for M1. In another words, the banking regulation does matter for choosing the appropriate concept of money;

(b) the welfare cost of the bank resource missallocation compared with the optimum choice in a financial system that competes with all prices. This cost is measured by the area under the Marshallian demand for bank service schedule net of its consequent marginal cost;

(c) the welfare cost in the market for deposits compared with the first best choice. This cost is represented by the area below the Marshallian demand for deposits schedule net of the opportunity cost of holding non-interest earning deposits -- nominal interest rate.

Thus, the sum of the triangles under the Marshallian demands for each component of M1 is the upper bound for the welfare costs of inflation in the worst banking system considered -- with service or non-price competition. While the lower bound is the triangle under the demand for monetary base schedule, which is due to the net benefit of the optimum service. This happens with interest and fee competitions.

On the other hand, in terms of the total welfare costs, the distortions caused by the banking regulation make a range on the welfare costs of inflation. In particular, the non-price competition imposes additional welfare loss. Thus, the optimal quantities derived in this banking system are second best. While the optimal quantities in an unregulated banking system are first best because the welfare cost of inflation is minimized due to the benefit of bank service and interest payment on deposits.

These welfare costs or gain of banking regulation, beyond the welfare costs of inflation, should be measured under: (a) the demand for service schedule net of the marginal cost of resource involved; and (b) the demand for deposits schedule net of their opportunity costs. These evaluations are made with respect to the undistorted first best solutions.

# APPENDIX

## ON BANKING REGULATION

A banking regulation that induces both the interest and fee competitions can deliver Pareto superior allocations compared with any other types of competitions, such as one with interest or another with service.

In this sense, to obtain a more suitable financial system than the existent ones in several countries, in terms of welfare, it is worthwhile to suggest some regulatory propositions:

(1) Banks should, at least, compete with interest in the markets for deposits and loans. Thus, deposits, specially, demand deposits, should pay competitive interest. In particular, interest ceiling should be avoided;

(2) The prohibition of free bank services is desirable so as to avoid: (a) the inflation tax rent collection by banks; (b) the overbanking; and (c) an increased spread on interest rates. This spread is directly affected by the imputed marginal costs, which leads to the financial disintermediation (less deposits and loans); and

(3) Bank operating costs, in terms of compensation for employees and physical capital consumption, have to be covered only by competitive explicit service charges.

If these propositions come forward, the SNA (System of National Accounts) will not need to subtract the imputed bank service charges anymore, but the real ones, from gross national value added. Furthermore, the concept of nominal industry -- made by the SNA only for the financial sector -- will become useless. Thus, the banking industry will not be longer the unique one, besides the public enterprise, that does not charge directly its marginal costs.

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