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MONEY AND SPACE: THE BEHAVIOUR OF LIQUIDITY PREFERENCE OF BANKS AND PUBLIC IN A PERIPHERAL COUNTRY[*]

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SUMÁRIO

Abstract: This paper aims at analyzing the role of several monetary variables in the development of different regions based on particular understandings of what a region is and the money functions in capitalist economies. The concepts of central place and economic poles are used to characterize the Brazilian regions. The concept of liquidity preference is used to analyze the effect of money behaviour on the regional economic performance. The analysis of data is accomplished by using the Principal Component Analysis and the Cluster Analysis.

Key Words: **Regional Economics, Financial System, Money, Liquidity Preference.**

Anpec Area: Area 5 – Regional Economics and Agrarian Economics

JEL: E60, G21, R12

INTRODUCTION

Studies of the Brazilian regional issue have always been characterized by the economy's real variables behaviour (production, employment, wages, etc.). Additionally, the fact that monetary and financial variables are recurrently neglected in such studies is also highlighted. Such a view may be justified by three factors (AMADO, 1998 p.418):

i) the influence of neoclassical thought on regional studies. As it is known, such a school takes money simply as a mean of trade unable to affect the real variables of the economy. Thus, the financial system would be a mere intermediary between savers and investors, being neutral, such as money, in relation to the development of real variables;

ii) the acceptance of the horizontalist notion of money supply by those who disagree with the neoclassical school. Such a notion supports that the money supply is adjustable to the real variables, being able to vary according to any pattern of demand for money. In this way, the money supply would not be able to affect the economic dynamics;

iii) the absence of satisfactory data for analyzing the regional issue in the financial and monetary perspective.

Among the factors listed above, the latter can be taken as an effectively restraining element of the financial analysis of regional issues. However, despite such a restraint, recent studies (Amado 1997, 1998, 1999) have proved that it is possible to extract relevant inferences from the subject. This is the main goal of this paper. Having in mind that such a theme is relatively neglected in an exploratory fashion, this paper mainly aims at analyzing the role of monetary variables in the development of different regions based on particular understandings of what a region is and the money functions in capitalist economies. The paper is divided into four sections, besides this introduction. Section 1 discusses the theoretical views present in the paper. The role that money could have in regional analysis based on a post-Keneysian approach and the region's notion to be used are analyzed. Section 2 shows the data and indicators used in the study. Such data are analyzed by using the statistical techniques of the Principal Component Analysis (PCA) and Cluster Analysis in Section 3. Finally, some conclusions are outlined in the last section.

I. MONEY AND SPACE: THEORETICAL ASPECTS

I.1. Regional analysis in a Post-Keynesian perspective

A remarkable aspect in the literature of regional economics is the little attention given to money and its role in regional development. Several models of regional income determination - as the neoclassical, the cumulative causation, and the input-output ones – do not take the impact of money and financial variables into account. When approached, such variables are mostly treated as econometric models in which some national monetary variables – taken as exogenous – affect the regional income determination in function of each region's specific characteristics. Hence, money and monetary flows have been treated as the result of differences among regions and not as the cause of such differences.

According to Rodriguez-Fuentes (1998), the main reasons for the absence of references to monetary factors are: 1) the orthodox hypothesis that money is neutral in the long run, and being so, it could not explain actual values at regional level; 2) the fact that regions do not use monetary policy tools, which make them meaningless for the study; 3) the fact that regions are extremely open and face a perfect capital mobility just like a small and open economy.

The neutrality of financial variables is assumed by the economics mainstream to which real income is dependant on real factors only. In such a context, money is viewed only as a veil facilitating trades and adjusting the general price level. Banks, in turn, are also taken as neutral, as they simply allocate available savings in alternative projects. As for regional level, the banking system would only affect the performance of real variables when it fails to allocate the national credit among the different regions, due to market failures, such as imperfect or asymmetric information, or barriers to its action as transaction costs[2]. When none of such problems occur, the regional credit market would be acting in an appropriate way and balance the interregional financial flow and the regions would not face financial hindrances?? as they would count on a perfectly elastic curve of credit supply.

Although the roots of regional income differences may be found in structural factors, monetary variables may account for maintaining and amplifying such differences in regional income when an approach in which money and banking are always non- neutral for regional development is adopted. Post-Keynesian works in this line of approach have recently emerged in the economic literature.[3]

The post-Keynesian money theory considers money an integral part of the economic process and, thus, a clear distinction between the monetary side and the real side of the economy can not be made (DOW, 1993). For the post-Keynesians, money is not exogenous and it enters the economic system through credit generated by the banking system and induced by its demand. Thus, credit allows the determination of investment, instead of determining the general price level, in this way making money an integral and non-neutral part of the economic process.

The post-Keynesian analysis is also distinguished from the others as it approaches both the supply side and the demand side in the regional credit market. For these authors, the supply of and demand for credit are interdependent and affected by liquidity preference, linked to the expectations of the economic agents in an uncertainty environment[4]. From the viewpoint of the banking system, liquidity preference will negatively affect its disposition to lend money in the region, if it shows pessimistic or less reliable expectations of its performance. On the demand side for credit, the liquidity preference from the public will affect its respective portfolio decisions. The greater the liquidity preference, the greater the positions of net assets of these agents and lesser the demand for credit.

[2] Roberts and Fishkind (1979), Moore and Hill (1982) are authors who first attempted to identify factors which could lead to credit rationing in regional markets. Recently, neo-Keynesian authors, as Faini et al. (1993) and Samolyk (1994), have explored the argument of asymmetric information in regional credit markets.

[3] For an empirical study of this theory at international level, see Dow (1990). See Amado (1997) for an application to the Brazilian case.

[4] Uncertainty in this case is differentiated from risk and may be identified by its unmeasurable characteristic, as opposed to the concept of risk which can be measured in quantitative terms (KNIGHT, 1991). For a further understanding of the use of such a concept in the Keynesian economics, see Davidson (1982/1983, 1993, and 1995), Dow (1995), Crocco (1999).

Based on such notions and using elements from the cumulative causation and dependence theories, Dow (1982, 1987) presents some models where the financial system together with the economy's real side may foster unequal regional development patterns. Dow (1982) attempts to translate liquidity arguments into a spatial context. Thus, the higher the monetary multipliers in contemporary economies with an equal monetary base, the more optimistic the expectations on local prices of assets; a higher degree of financial development and a more favorable trade results with other regions.

Two extreme cases in regions with different characteristics are considered: a central region and a peripheral region. The center would be a prosperous region with active markets and a sophisticated financial system. The periphery would be a stagnated economy with feeble markets and a lesser degree of financial sophistication.[5] As a result of such characteristics, liquidity preference would be higher in the periphery; the liquidity of any asset would be higher in the center than in the periphery, and; the banking multiplier would be greater in the center in the long run. Furthermore, the spatial context would allow the agent to simultaneously hold assets from the economies of several regions, implying not only the spatial endogenization of the monetary base but also reinforcing the distinct character of regional money supplies[6].

In her 1987 analysis, Dow concentrates her attention on Myrdal's ideas of cumulative causation (1957), which were adopted by Keynesians like Kaldor (1970), and on the dependence theory associated to neo-Marxian ideas such as those of Baran (1957), Frank (1966), and Cardoso (1973, 1978, and 1979). According to the cumulative causation theory, Dow states that the financial sector is one of those sectors in the center that will profit from the dynamic economies of scale. The fact that financial institutions tend to have their headquarters located in the center implies a distancing from the demands for investment in the peripheral region and a hindrance?? to credit granting. Given this scenario of spatial decision concentration, the lines of the neo-Marxian approach are relevant to the understanding that power on credit provision is not only able to cause problems of credit availability for the periphery but also that it could be biased so as to favor some industries. Thus, there is a distancing between the place of investment and the place of control, and hence the way such an investment is accomplished is what holds dependence and underdevelopment.

The center is defined as the locus presenting a productive structure historically dominated by the industry and commerce and where the financial center is located. The periphery, in turn, has its activities concentrated in the primary sector and low-technology manufacturing with an economic dynamics centered on exports to the center, being its sales revenues sensible to the center's current situation, thus, highly volatile. The center has spread effects on the periphery not only in its demands for products but also in the diffusion of technology, qualified labor, and services through its branches, promoting in this way the center/periphery dependence.

[5] The model takes into account the fact that even within a nation the financial innovations can only be extended from the financial center to remote regions after a given time lag and that additional transactions and information costs enhance such a difference.

[6] Dow (1982) works with a regional-based banking system. However, her arguments of money supply differences are still valid for a national banking system where capital flows may be increased and the destination of money allocation greatly depends on the centers where capital flows to and deposit levels are higher.

Such characteristics imply that liquidity preference will be greater in the periphery for its residents whether banks, entrepreneurs, or the public. The reasons for this would be the high risk of capital loss for the banks, related to the default risk of loans; a change in the marginal efficiency of investment for the firms which is affected by the smaller availability of loans and higher bank interest rates; and the uncertainty about the public's earnings both of them associated with the economy's volatility.

The result is that national banks may lend less money to the periphery, due to its economic structure and the remote control over their branches. The specific periphery banking, in turn, would rather maintain a higher reserve level and restrain local loans, being in a relatively disadvantaged position and, in this way, encouraging banking concentration in the center. Furthermore, the greater liquidity preference of the peripheral public would be translated into a higher portion of demand deposits than of time deposits, which would force the banks to curtail their loan terms in order to adjust them to the smaller portion of time deposits, thus generating fewer long-term resources for the region.

I.2. Regions and Centrality

Christaller (1966) argues that the distribution of urban population in space is directly related with concentration of specialized services. Great urban centers would count on specialized – central – services that would provide them with an economic efficiency higher than that found in smaller centers. For this reason, the greater center would be converted into a service supplier to the smaller neighboring centers.

Christaller's major concern (1966) refers to the formation of urban centers network as well as the reason for the existence of different city sizes and irregularities in the way they are distributed. Therefore, the author develops the notion of central goods and services and central place networks as well.

The characteristic centrality of a central place stems from a region's high population density and economic activities so as to allow this region to supply central goods and services, such as wholesale and retail trade, banking, business organizations, administrative services, education and entertainment facilities, etc., i.e., a central place would play the role of the locus of central services for itself and for the immediately neighboring areas (supplementary region). Such goods and services would be considered central due to the need that they be localized in regions whose demand is sufficiently great to encourage their production as well as for the geographical range of such a function.

From this definition of central place, Christaller (1966) admits the existence of a hierarchy of central places, according to smaller or greater availability of goods and services which need to be centrally localized (central goods and functions). The rank of a central good or service is as greater as more essential it is and as greater is its market area. The importance of central places is greater as more goods and services can be provided by them (Bampi, 1983).

Accordingly, despite the reference to its size and distribution, it is not the population which will provide a hierarchically-framed net of cities, but the distribution and range of goods and services defined as being central.

Parallel to this understanding of the service sector relevance, Perroux's polarization theory (1977) proposes to define a region in view of its economic nature and power or dominance position in geographic spaces which would allow to classify regions among pole regions and dominated regions.

This author developed his ideas related to the post-war concept of economic space in a context in which a consensus prevailed that a national economy was confined to the national borders. In this way, economy would be limited by space. Such an insight of economic space would create what Perroux called pathological complexes or complexes related to the limitation imposed by space. The pathological complexes would be derived from a simplistic notion of space found in the Euclidean geometry "defined in two or more dimensions where the objects were confined in its interior" (Rolim, 1982 p.580).

The establishment of a new economic space idea – free from spatial conditions – would depend on the disruption of such an elementary idea of Euclidean space. For this, Perroux made use of the mathematical concept of abstract space which, according to him, would better represent the intricate economic relations in a given country. Rolim makes it clear that

> *the objects would be defined in themselves through abstract relations and the set of such relations would be the space. Hence, there would be as many spaces as the systems of abstract relations defining the objects (...) there would be as many economic spaces as the number of studied phenomena* (Rolim, 1982 p.580).

In this way, a delocalization of economic activities is made, in detriment to the vulgar space "defined by geonomic relations [*geonomic space*] among objects [men and things]". The economic spaces would be abstract spaces defined by economic relations among economic elements, dissociated (or delocalized) from the vulgar space and geographic restraints.

The understanding of the economic space concept is crucial for the understanding of the regional polarization theory proposed by Perroux, which mainly addresses to the relations between a pole region and its set of influence. His major concern was to understand the differentiated growth among regions, which denied intended balanced growth. Conversely,

> *growth does not simultaneously appear everywhere (...) It appears in spots or growth poles with variable intensity and is expanded through several channels and with variable final effects over the economy as a whole* (Perroux, 1977 p. 146).

Perroux (1977) starts from the implementation of certain industries in a given region to explain the formation of a growth pole. Such industries are called motive firms[7] and the other firms – influenced by the former – form the influenced set. Such an influence basically occurs by means of external economies of production stemmed from the motive industry, representing advantages for the functioning of the influenced set. This would open the possibility for the growth of a number of firms based on a growth induced by the motive industry.

[7] The motive industry is defined by Perroux (1977) as that "with the property of increasing sales (and purchase of services) from another, or from several other industries [induced set(s)], as it increases its own sales (and its purchases of productive services)" (Perroux 1977: 152).

In complex industrial poles, formed by the set of firms – motive and induced –, territorial agglomeration would be added to the inducing activity of the motive industry by concentrating firms and human contacts in the same place. Collective needs such as public services, schools, and transport, which attracts new firms, will be developed, reinforcing the initiated growth direction. In this sense, the complex industrial pole is a

> *center of accumulation and concentration of human and capital means geographically concentrated which is able to change its geographic environment and, if it is empowered enough, able to change the whole economic structure of the nation in which it is located* (Nogueira, 2000, p. 13).

II. DATA SOURCE AND METHODOLOGY:

Taking the two authors previously discussed - Christaller and Perroux – as reference, researchers at CEDEPLAR – UFMG (a center for regional development and planning of the Federal University of Minas Gerais) used Isard's gravitational model (1960) to elaborate a new Brazilian regionalization, having in mind the importance of the service sector for the definition of the country's dynamic poles and its respective influence areas (a research project entitled *Dinâmica Demográfica, Desenvolvimento Regional e Políticas Públicas* [Demographic Dynamics, Regional Development, and Public Policy], funded by PRONEX). By understanding space from Christaller and Perroux's concepts, the study argues that the *de facto* economic regionalization of the country does not correspond to the administrative regionalization under the form of federative states.

The initial results of the research by Lemos, M.; Diniz, C.; Guerra, L. (1999) have proved that such an understanding is correct. Through a disaggregated analysis based on the country's microregions, the study shows that the *de facto* economic regionalization is quite different from the Brazilian territorial division. Instead of the current 26 states, the research study proposes a regionalization where there are only 11 macroregions. Such poles would be: Porto Alegre; Curitiba; São Paulo; Rio de Janeiro; Belo Horizonte; Salvador; Recife; Fortaleza; Belém; Manaus; Brasília and Goiânia (MAP 1). It can be noted that some administrative regions are entirely economically polarized by others as is the case of Santa Catarina, Espírito Santo, and several other Northeast states. Furthermore, other administrative regions have part of their territories economically polarized by other poles. This is the case of Minas Gerais which loses part of its territory for São Paulo and Rio de Janeiro.

MAP 1

The Brazilian macroregions drawn from their polarizing effects

Source: The Municipal Network – IBGE (the Brazilian Census Bureau), 1994

The wage mass in each great center was the major variable used for calculating the indices allowing to determine the polarization degree by means of which an index of subcontracting was obtained in which the wage mass of the service sector was weighed in relation to the total wage mass. This subcontracting index constituted the starting point for the accomplished regionalization. Choosing the service sector wage mass as the major variable is in accordance with the theory proposed by Christaller.

The behaviour analysis of the macroregions will be made by using six variables in an attempt to match real and spatial factors – income, employment, and centrality – as well as factors which capture money and financial system effects.

In order to capture the spatial characteristics of a macroregion, a centrality index was obtained, based on the works of Lemos, M. et al. (2001) and Lemos, M., Guerra, L. and Moro, S. (2000) for the

1990's. To determine this index, the average productivity of each macroregion (the proportion between the metropolitan income and occupied labor), an adjusted subcontracting index (the proportion between the service sector wage mass and the total wage mass), and the number of poles in each region were taken into account. Such an index is an attempt to capture all regional aspects able to explain distinct development patterns, such as dynamic poles, urban density, and productive efficiency. According to Christaller's theory, the centrality index makes possible the ranking of macroregions. The results can be visualized in TABLE 1 and by the DENDOGRAM 1.

TABLE 1

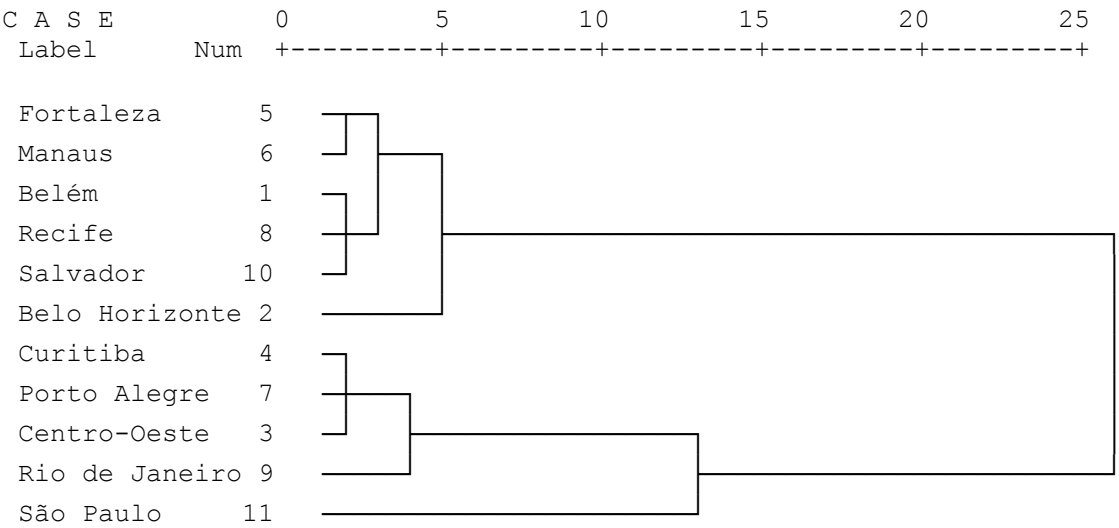
Centrality and Dynamism Index

Macroregion	Index
São Paulo	1.972
Rio de Janeiro	0.946
Brasília	0.518
Porto Alegre	0.373
Curitiba	0.232
Belo Horizonte	-0,277
Salvador	-0,727
Belém	-0,869
Recife	-0,955
Fortaleza	-1,216
Manaus	-1,220

Source: Barra (2002)

DENDOGRAM 1

Rescaled Distance Cluster Combine



In our first attempt of division, we can see that there are four clear clusters in the macroregions as for the centrality index: the first grouping is composed of Fortaleza, Manaus, Belém, Recife, and Salvador, whose characteristics make it possible to name it peripheral cluster. The Brazilian North and Northeast are acknowledgedly less developed regions in economic, social, and financial terms, presenting low values of average productivity, subcontracting level, and number of poles. The second cluster can be understood as bordering and includes only the macroregion of Belo Horizonte. This macroregion is located in an intermediate point between the peripheral and central regions, since despite the dynamism of its capital it encompasses scarcely developed mesopoles in its macroregion as those located in the northern and northwestern Minas Gerais.

The third cluster is composed of more developed macroregions and it can be called the central cluster. It comprises Curitiba, Porto Alegre, the Center-West (Brasilia), and Rio de Janeiro. These macroregions present good productivity levels although far from those for the macroregion of São Paulo, but far in advance of the other macroregions. The last cluster is exactly the latter, which can be called de super central cluster.

In addition to the centrality factor, data were used that could reflect both the economic sphere and the financial sphere present in the Brazilian regional scenario. The Brazilian Central Bank was greatly responsible for the availability of data which enabled the present analysis as for the country's financial characteristics. This analysis was made possible through the PCJS0006 program which, among others, provides data on numbers for branch banking, credit operations, government and private demand deposits, savings, time deposits, and bonds receivable for the period 1988-2000 for the banks which are present in all the Brazilian cities.

Such data enabled us to offer an idea of the behaviour of banks and the public related to allocation of their assets in shorter or longer runs. The account for "credit operations" reflects part of the bank assets with smaller liquidity, including government funding and transfers for investment. The accounts "demand deposits", "savings", and "time deposits" are found under the liabilities of the banks' balance sheets and provide an insight of the public's behaviour in general, the banks being intermediaries. The public makes its asset allocation decisions among the accounts mentioned above, by considering the uncertainty degree and the information volume available in the regions. The choice is between holding higher liquidity assets, in case of a greater degree of uncertainty related to the current situation, or lower liquidity, in case the scenario is more trustworthy. An attempt to measure such a behaviour was made through the Public's Liquidity Preference index– PLP – with the following formula:

$$PLP = \frac{DDp + DDg}{TD + SAV}$$

where,

DDp = private demand deposits;
DDg = government demand deposits;
TD = time deposits;
SAV = savings.

The higher this index, the higher the public's liquidity preference, as it chooses the accounts with higher liquidity among those offered.

As for the banks' behaviour in relation to a specific region, it may vary in accordance with the institutional framework of the banking system in question. The differentiating element is that a country's banking system is made up of regional banks or national banks with branch banking throughout its territory. Such a differentiation implies distinct patterns of portfolio decisions, as in the latter system such a decision will be centered in the central regions' branch banking, which makes peripheral (or provincial) branch banking play a mere intermediary role in financial flow; i.e., the decision to invest in short or long-run assets is not placed in the peripheral branch bank, but in the headquarters located in the central region.

This was the characteristic of the Brazilian financial sector captured by the asset analysis of the banking balance sheets. The main idea is to analyze bank's behaviour in the brazilian scenario. The following index – BLP as 'Bank's Liquidity Preference' – shows how a bank chooses to have more or less liquid assets according to the degree of the economic development of the regions. The accounts used to show that were 'Credit Operations', which represents the banks' intentions to lend money; and 'Demand Deposits', which represents the public intention to keep higher liquidity funds. The use of those accounts is a way of measuring how the banks manage both their balance sheets and their will to lend and borrow money throughout the regions. According to the BLP,

$$BLP = \frac{\text{Private DEMAND DEPOSITS + Government DEMAND DEPOSITS}}{\text{CREDIT OPERATIONS}}$$

it is expected that the higher the index, higher is the bank's liquidity preference; the banks are choosing less liquid assets (lending less) or the public is keeping their funds more liquid, what means that the public intention to borrow money or to invest in savings and time deposits decreased. It is clear that banks credit functionality requires both the perception of the public's will to borrow and the bank's will to lend and borrow money. The two spheres are directly correlated with the regional and national macroeconomic situation, which means that the liquidity preference changes as well as the economic welfare and uncertainty of the regions and the country changes.

It is also expected from the pointview of a national banking system previous presented in this paper that regions with a higher degree of polarization and centrality may have such a low indicator, as they would be receiving resources from the peripheral regions to be invested in lower-liquidity, long-run assets.

TABLES 2 and 3 show the performance of these two variables for the years 1990, 1994, and 2000.

TABLE 2

The Public's Liquidity Preference

Macroregion	1990	1994	2000
BELÉM	1.19	0.95	0.24
BELO HORIZONTE	0.25	0.13	0.20
CENTER-WEST	0.69	0.12	0.23
CURITIBA	0.23	0.14	0.20
FORTALEZA	0.48	0.25	0.19
MANAUS	1.48	0.59	0.33
PORTO ALEGRE	0.44	0.17	0.16
RECIFE	0.43	0.26	0.24
RIO DE JANEIRO	0.48	0.22	0.18
SALVADOR	0.43	0.18	0.23
SÃO PAULO	0.20	0.10	0.17

Source: Prepared by the authors from the Central Bank's data

TABLE 3

Bank's Liquidity Preference

Macroregion	1990	1994	2000
BELÉM	0.18	0.33	0.29
BELO HORIZONTE	0.09	0.09	0.22
CENTER-WEST	0.06	0.10	0.12
CURITIBA	0.10	0.09	0.17
FORTALEZA	0.12	0.15	0.26
MANAUS	0.33	0.28	0.48
PORTO ALEGRE	0.10	0.10	0.15
RECIFE	0.12	0.13	0.30
RIO DE JANEIRO	0.07	0.15	0.18
SALVADOR	0.10	0.10	0.21
SÃO PAULO	0.10	0.08	0.11

Source: Prepared by the authors from the Central Bank's data

TABLE 2 and 3 clearly show a consistency between the public's liquidity preference indicator, the bank's liquidity preference and the centrality degree of the macroregions. It was precisely those regions presenting lower indices of centrality and economic dynamism which also presented a higher liquidity preference by the bank and the public all through the decade. The macroregions which were called peripheral, in accordance with a cluster analysis for the centrality index (Manaus, Belém, Fortaleza, Recife, and Salvador), presented ones of the highest PLP and BLP indices in the last decade. São Paulo, in turn, presented the lowest PLP and BLP in the years 1994 and 2000, only losing such position to the macroregion Center-West in 1990. The macroregion Rio de Janeiro is outstanding here, as its values for this variable in the first half of the decade were comparable to those for the most dynamic regions, declining in 1994 and 2000. This reflects the economic decay of this macroregion during that period.

Finally, the distribution of the bank branches through macroregions is presented in TABLE 4, where the weight of the great centers in such a distribution is clearly perceived.

TABLE 4

Bank Branches

Macroregion	1990	1994	2000
BELÉM	560	584	417
BELO HORIZONTE	1074	1010	1032
CENTER-WEST	964	1047	992
CURITIBA	1717	1848	1672
FORTALEZA	499	526	421
MANAUS	188	182	157
PORTO ALEGRE	1704	1843	1678
RECIFE	887	783	665
RIO DE JANEIRO	1666	1762	1971
SALVADOR	969	1024	827
SÃO PAULO	5654	5935	6064

Source: the Brazilian Central Bank.

The data determining what we called the 'economic performance' of the macroregions were collected from the RAIS (an annual listing of information and wages – employees – of the Brazilian Ministry of Labor and Employment) for the years 1990, 1994, and 2000. Total earnings and the total employment in December in the respective years were used as proxy for the economic performance in the regions.

III. METHODOLOGY AND ANALYSIS OF RESULTS

Two statistical techniques of multivariate analysis were used*: the principal component analysis* (PCA) and the *cluster analysis*[8]. These techniques allow us to present the major characteristics of each region and constitute clusters of regions, according to the performance similarity in the data used.

The technique of *principal component analysis* (PCA) has as its basic goal to construct a set of statistically independent variables Z_n , which are formed from a linear transformation of the observed variable set. The observed variables need to be correlated at the beginning of the process and it is not necessary to make initial assumptions concerning the likelihood distribution of the original variables. Each variable Z will be called major component and constructed as follows:

$$Z_n = a_{n1}X_1 + a_{n2}X_2 + ... + a_{nn}X_n$$

[8] For these techniques, see Pereira (2001), Andrade (1989), and Mardia (1988).

Then, it can be defined how much of the total variation of variables X the major component is able to reproduce and which coefficients of their equations are different from zero. The variances of Z_i are obtained from the autovalues of the covariance matrix of observed variables and the autovectors, associated to these ranked autovalues, provide the coefficients for the major components. The first major component Z_1 will explain the highest variation percentage in the observed data; the second component Z_2 will account for the second highest variation and then successively so that we can have:

$$\text{Var}(Z_1) \geq \text{Var}(Z_2) \geq \ldots \geq \text{Var}(Z_n)$$

where Var (Z) is the variance of Z in the observed data.

According to the kind of variables with coefficients significantly different from zero which comprise them, the major components can be called according to the characteristics which they translate. And depending on the degree of variance they reproduce, can be considered relevant for the analysis or not.

Once PCA is accomplished, it is possible to determine the value each region reaches in each major component as well as represent the regions in a dimensional plan where the components form the axes so that the positioning of the set of regions in the major component values can be perceived and which variables can better explain their positioning as well.

The technique of cluster analysis allows that clusters of regions may be formed in accordance with the performance similarity of indicators. These indicators are used in such a way that individuals with performance close to the analysis indicators be in the same group.

There are several techniques of cluster analysis which permit different measures of similarity and methods of grouping. The agglomerative hierarchical method was chosen for this paper. In this method, each of the *n* individuals is initially taken as being itself a group which will be subsequently forming other groups according to their similarities, up to the point where a sole cluster of *n* individuals is reached. The clusters are represented in a dendogram and the best grouping method can be defined, i.e., how many groups can better distinguish individuals by performance similarity in the variables.

The distance measure will be the Euclidean distance and the variables will be standardized in the distance calculus. The grouping method will be the *Average Linkage Between Groups*, which puts the individual in the average value cluster in the similarity measure of individuals more closely composing it. The ACP and cluster analysis techniques will be repeated for the years 1990, 1994, and 2000, providing a movement analysis in the regions in three different periods.

With such indices and data in hand, a joint analysis of all variables for the period was made by using the previously mentioned techniques. The choice of those three years referred to above aimed at relating the analysis in general to the national macroeconomic variations, namely: the hyperinflation period of the beginnings of the 1990's, the implementation of the *Plano Real* (economic adjustment plan) in 1994, and its development in 2000. According to PAULA (2001), at the beginning of the *Plano Real* the banking system offset its losses with the end of the float by expanding credit, taking advantage of the economy's boom wave and the expansion of the demand for credit. However, due to the successive crises in 1995 (Mexico) and 1997/98 (Russia), the banks returned to a defensive posture by increasing the liquidity preference and the share of public securities in their portfolios.

In view of such temporal scenario, a principal component analysis was accomplished. TABLE 5 represents the predominance of variables of each factor in the period and also the variance percentage of variables explained by the components.

As can be noticed, for the three years under analysis, the real performance variables and centrality account for component 1, and the financial variables - BLP and PLP – account for component 2. Furthermore, a clear contrast between performance variables and centrality on one side and liquidity preference by the public and the banks on the other can be noticed. That is, in all the analyzed years, the macroregions presenting a high PLP and BLP showed a comparatively weaker economic performance and smaller centrality as well. Such a result confirms the theoretical hypothesis previously assumed in this paper.

TABLE 5

Variables by factor and variance percentage of variables

Year	1990		1994		2000	
Variable/Component	Comp. 1	Comp. 2	Comp. 1	Comp. 2	Comp. 1	Comp. 2
Earnings	0.45	0.29	0.44	0.29	0.43	0.34
Employment	0.45	0.25	0.44	0.27	0.44	0.29
PLP	-0.33	0.57	-0.32	0.63	-0.33	0.62
Centrality	0.44	0.06	0.44	0.10	0.43	0.02
Branches	0.45	0.24	0.44	0.24	0.44	0.29
BLP	-0.28	0.68	-0.33	0.60	-0.36	0.55
Variances followed by components	0.73	0.94	0.74	0.96	0.79	0.95

CHART 1. PCA for 1990.

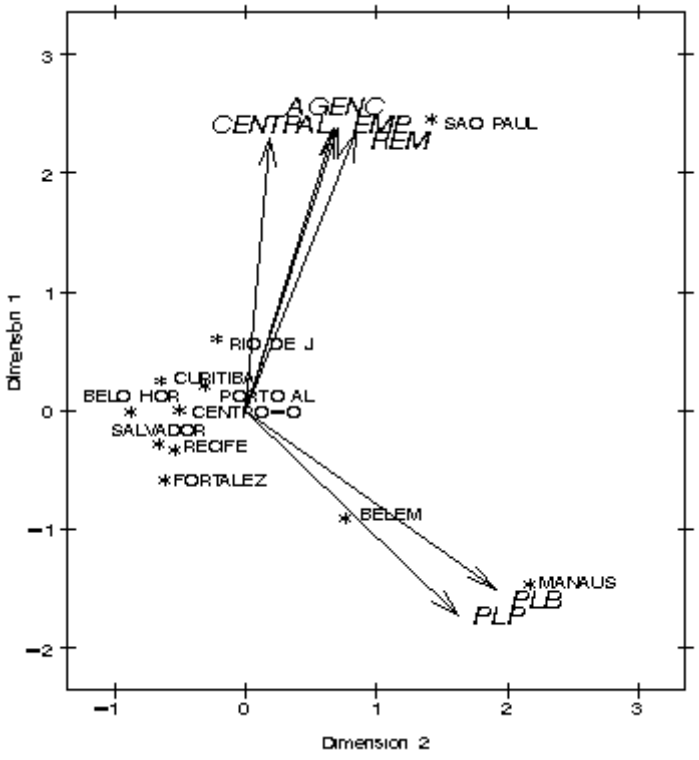


CHART 2. PCA for 1994.

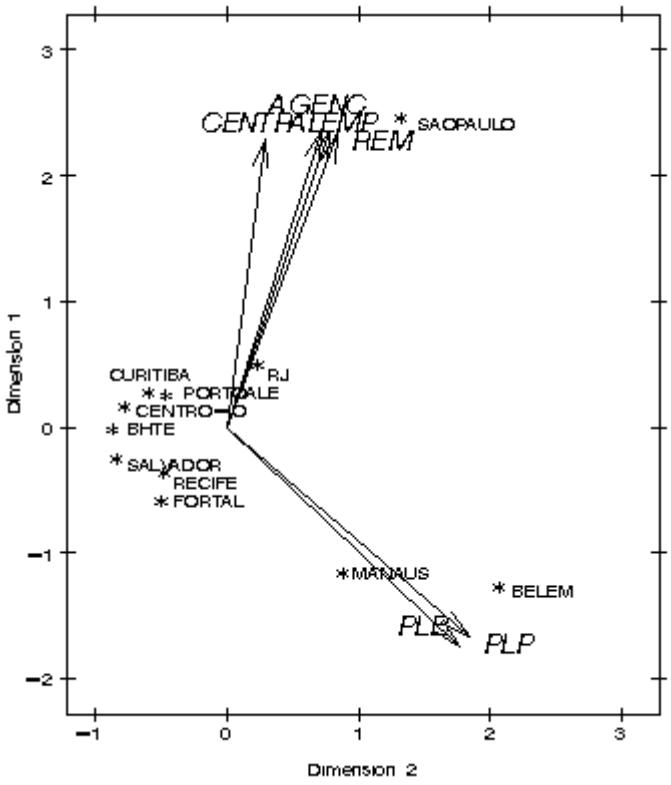
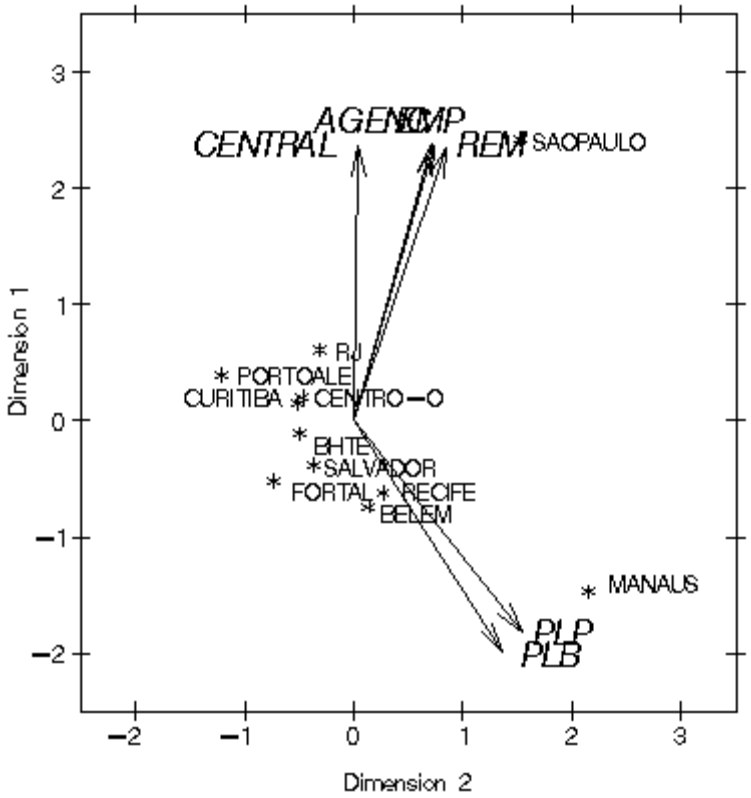


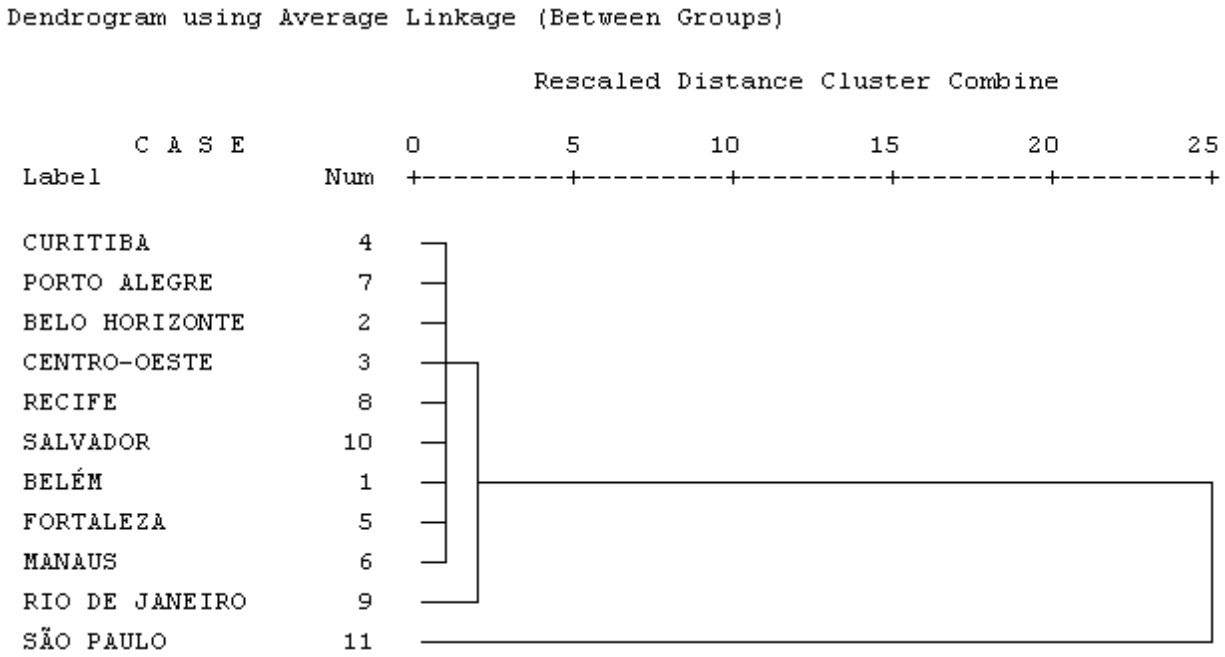
CHART 3. PCA for 2000.



For every year chosen it is possible to see clearly the opposition between the economic performance and the liquidity side of the analysis indicating that a better economic situation brings lower liquidity indices. The same group division also can be seen among the regions. São Paulo is isolated from the other macroregions as it presents a high economic performance and centrality, low PLP and BLP, confirming its dominance in the national scenario. In a clear contrast, Manaus presents a weak performance of real variables, high PLP and BLP. The macroregion Belém follows the latter but with a better economic performance and lower liquidity preference. The other macroregions form a large group that can be characterized as having a medium behaviour in terms of economic dynamism, being close to the averages of those variables (component 1) and the averages of the financial variables (component 2). This large cluster can be divided into two groups, as follows: a group formed by the macroregions of Rio de Janeiro, Porto Alegre Curitiba, Center-West, and Belo Horizonte, presenting a high-medium economic performance, and a low-medium PLP and BLP. Within the regions with high-medium economic performance one can find Rio de Janeiro, which contrasting with the previous ones, presented lower liquidity preferences, indicating a leadership of its group. Still in the group presenting medium economic performance, there is other group with low-medium economic performance, formed by the macroregions of Salvador, Fortaleza, and Recife with a high-medium PLP and BLP.

The cluster analysis confirms the results, in spite of impeding a further analysis of the effects of variables on the macroregions. Such analysis takes the macroregions jointly, with no individual weighing. This conceals the results for the universe of regions, since São Paulo is so differentiated that the other macroregions would belong to a same group with a small difference for the macroregion of Rio de Janeiro. The dendograms resulting from such an analysis are exactly the same for the three years analyzed, as can be seen in DENDOGRAM 2.

DENDOGRAM 2



For a more accurate analysis and in view of the results, the macroregion of São Paulo was taken out of the set of macroregions and a new centrality index was calculated without such macroregion (TABLE 6). With that procedure, it was possible to verify the regions' grouping degree, neglecting the effect São Paulo exerts on the results. As has happened in the PCA analysis, the same distribution ocurred for the years chosen. The only difference among the years is a better performance of the macroregion Belém and Fortaleza, improving their position in the groups presented. The clusters analysis visualized in DENDOGRAM 3, 4, and 5 show results similar to those of the principal component analysis illustrated in CHART 1, 2, and 3:

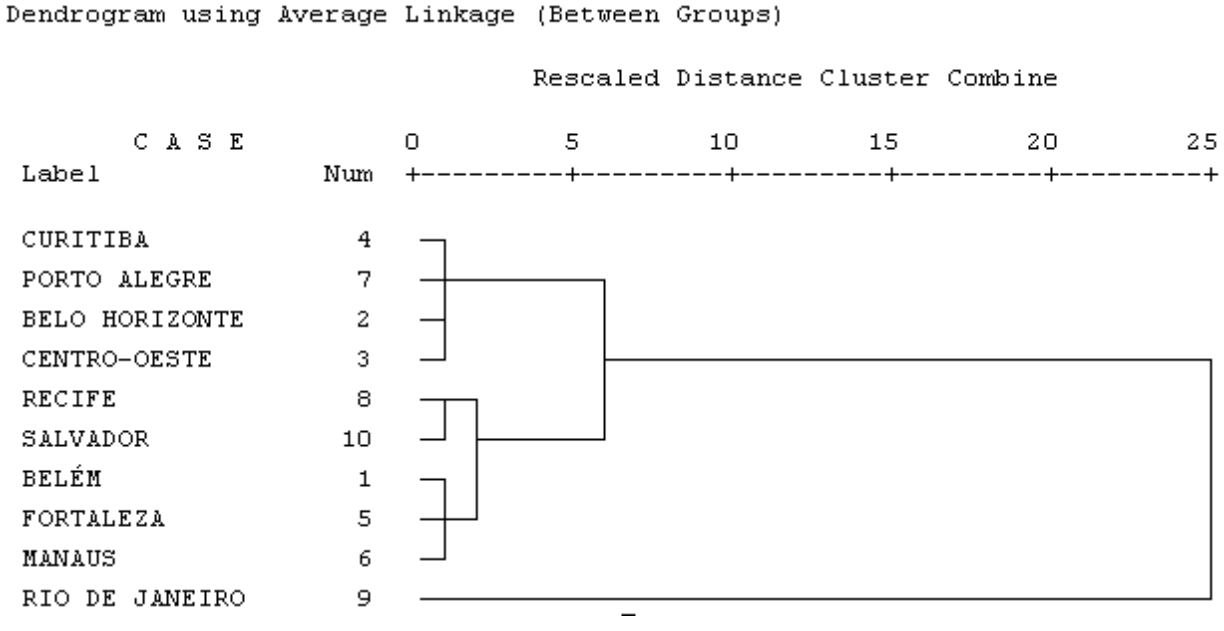
TABLE 6

Centrality and Dynamism Index

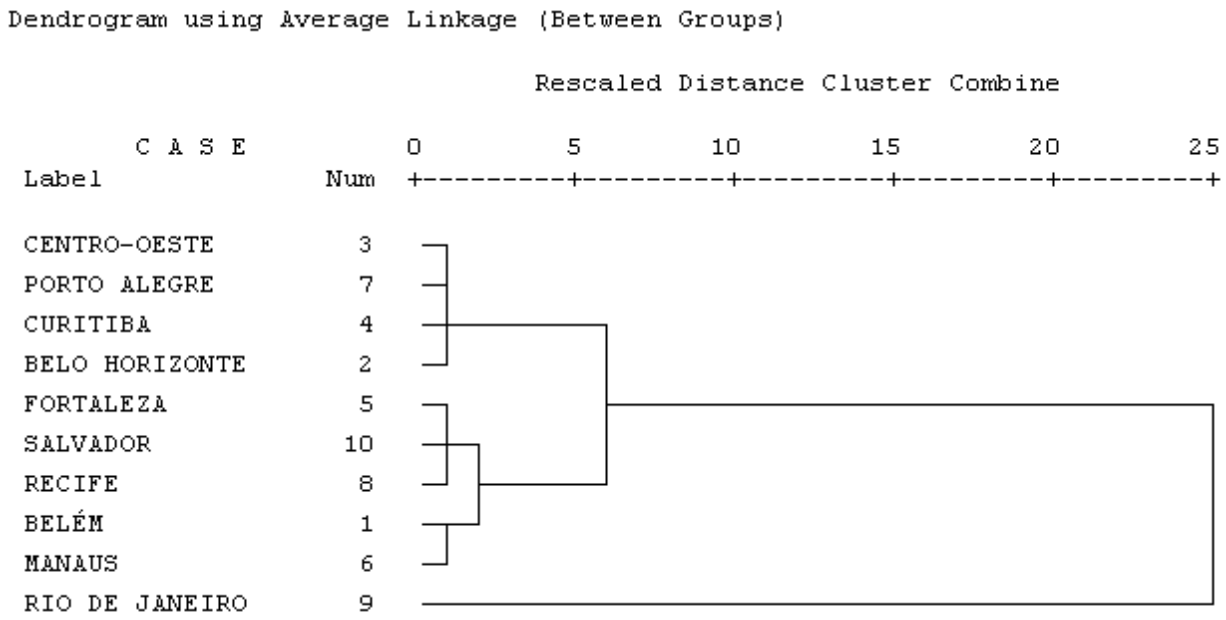
Macroregion	Index
Rio de Janeiro	1,32255
Brasília	0,97407
Porto Alegre	0,92434
Curitiba	0,71431
Belo Horizonte	-0,07887
Salvador	-0,70991
Belém	-0,83757
Recife	-0,981
Fortaleza	-1,32791
Manaus	-1,401

Source: Barra (2002)

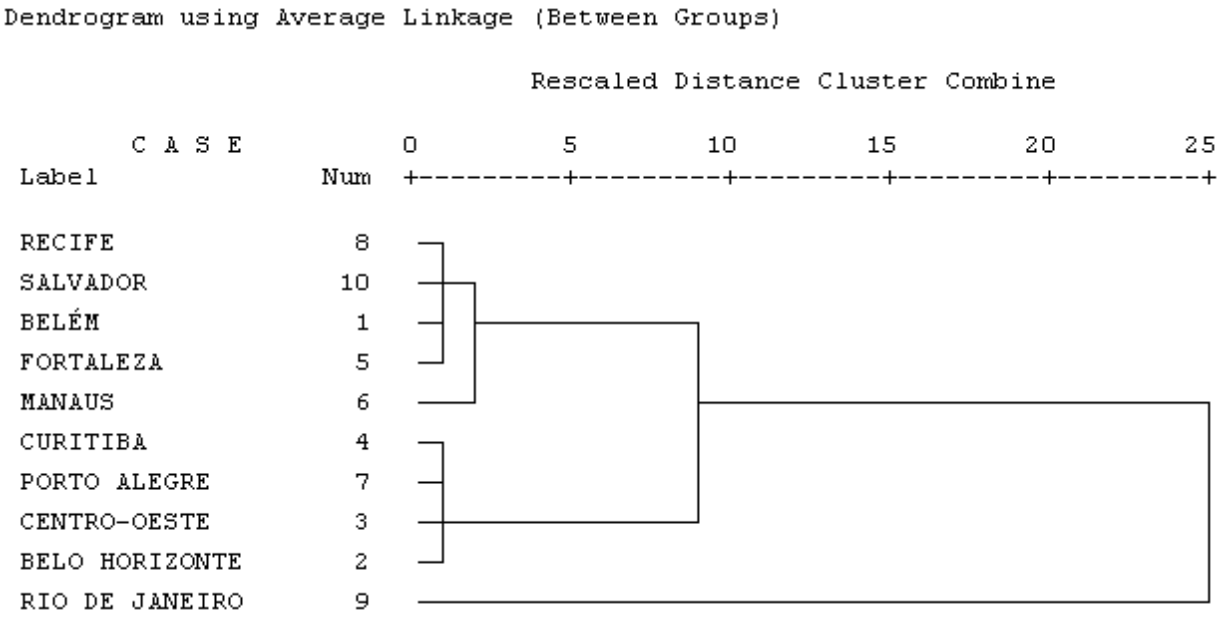
DENDOGRAM 3 for 1990



DENDOGRAM 4 for 1994



DENDOGRAM 5 for 2000



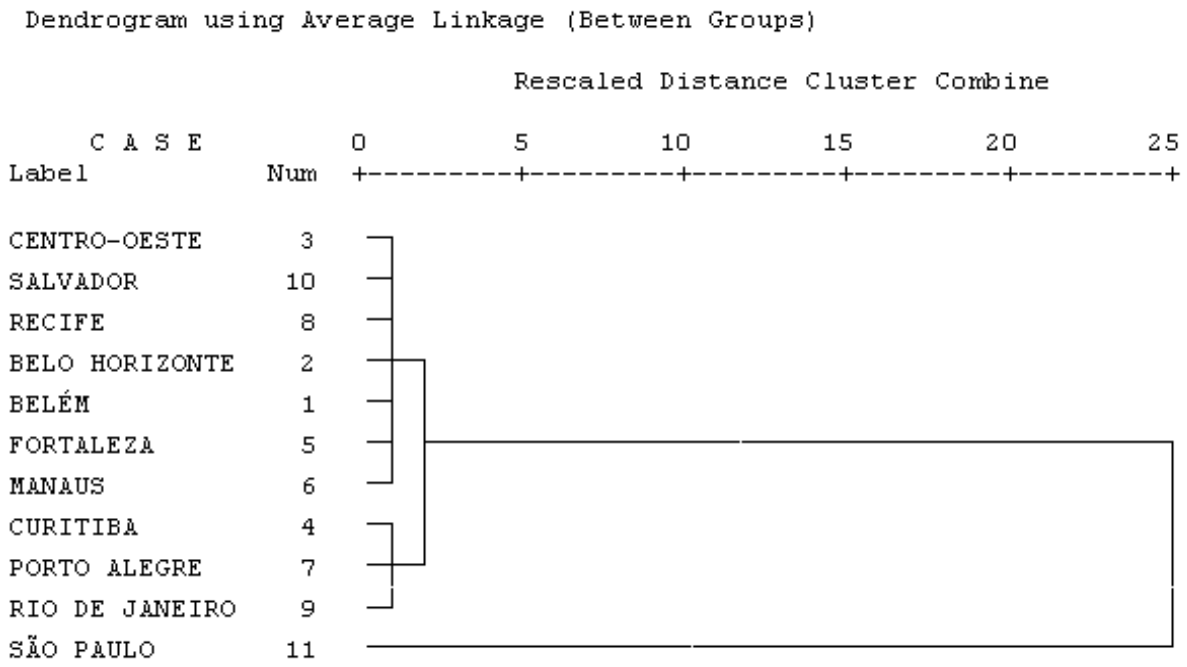
The macroregion of Rio de Janeiro replaces São Paulo as the leader, but not so further from the other regions. Besides the macro Rio de Janeiro with a better economic performance and low PLP and BLP, three similar macroregion groups can be noticed, namely: Curitiba, Porto Alegre, Belo Horizonte, and Center-West which form a group with high-medium economic performance, low-medium PLP and BLP; Salvador and Recife form another group with low-medium economic performance, high-medium PLP and BLP; and, finally, the last group with high PLP and BLP, and low economic performance comprises Fortaleza, Manaus, and Belém.

During the years, some of the pheripheral regions start to present different characteristics. The most remarkable ones are those for the macroregion of Belém and Fortaleza which comes closer to the medium group of regions, leaving behind Manaus, which implies better economic and financial variables with reduced liquidity preference; the characteristics for the macroregion of Belém are the most impressive, showing slightly better financial variables, decreased PLP, and a better performance in the region's poles. The groups of Rio de Janeiro and Manaus are still opposed to and differentiated from each other. The cluster analysis confirms the previous PCA one.

A general analysis may bring a simple resolution: that during the decade there weren't drastic diferentiations among the regions or the regions groups. In fact, the division of the groups remained quite the same, with slight moves by one or two regions. That behaviour can be easily understood if we remind to the national macroeconomic performance past the decade: high interest rates, mediocre economic growth, high taxation, and a increasing external vulnerability which brings others regional problems such as a low credit offer and investments. The macroeconomic performance constrained the regional development making the brazilian regions show an almost static economic behaviour.

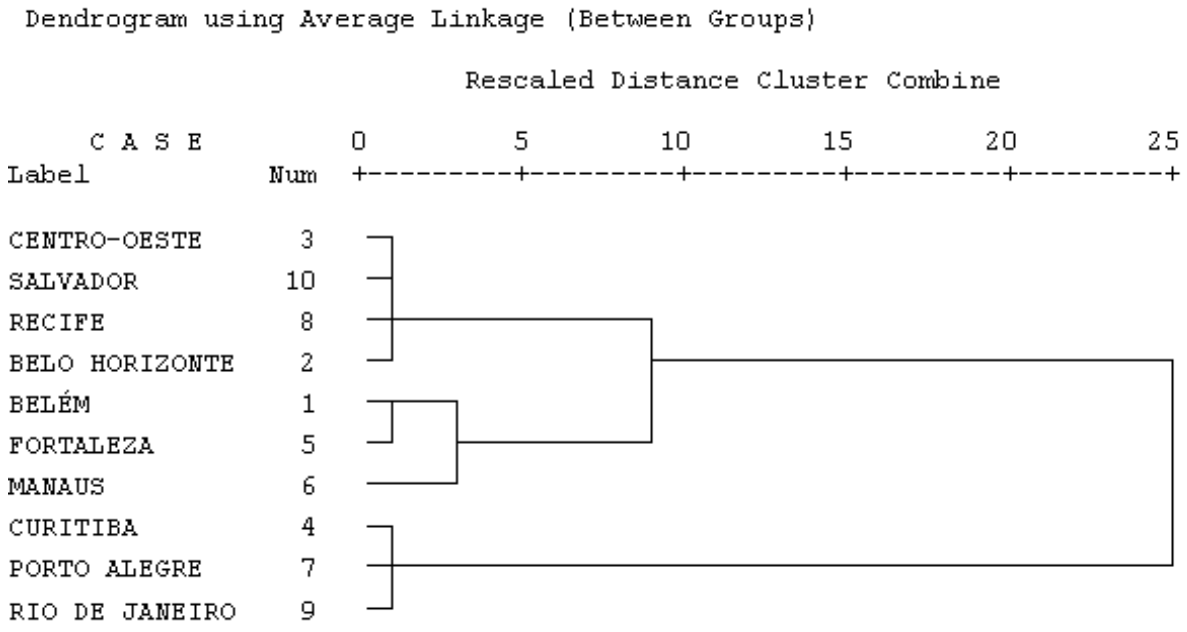
It is well known that the region economic situation has an important role in determining the financial variables, but there is a weight that comprises the analysis of the regions' groups when we confront both the economic and liquidity sides. That weight is the regional economic development, which depends on others several variables such as the degree of economic polarization, employment attraction, credit attraction, governmental action etc. Some of this variables are part of a historical and external process which has started a long time ago and has defined the political, social, and economic situation of each region considered. Acknowledging that and after having seen the results with the employment and income data, we decided to analyse the regions behaviour without taking the economic performance in hand and considering only the financial side. With that we may see the liquidity preference differences among the regions during the years. The cluster analysis visualized in DENDOGRAM 6 represents that.

DENDOGRAM 6

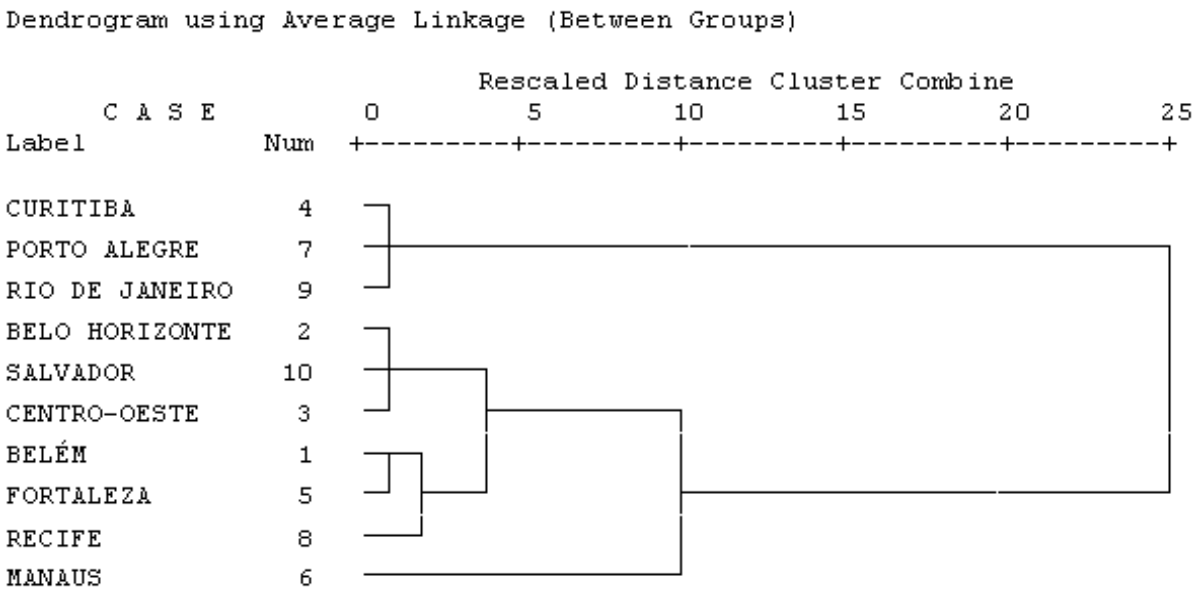


Once again the macroregion São Paulo is so differentiated that puts the others regions in two resembled groups, making difficult to see each ones own characteristics and further similarities. Again we removed São Paulo and his influence off the cluster analysis and the results are shown in DENDOGRAMS 7, 8, and 9.

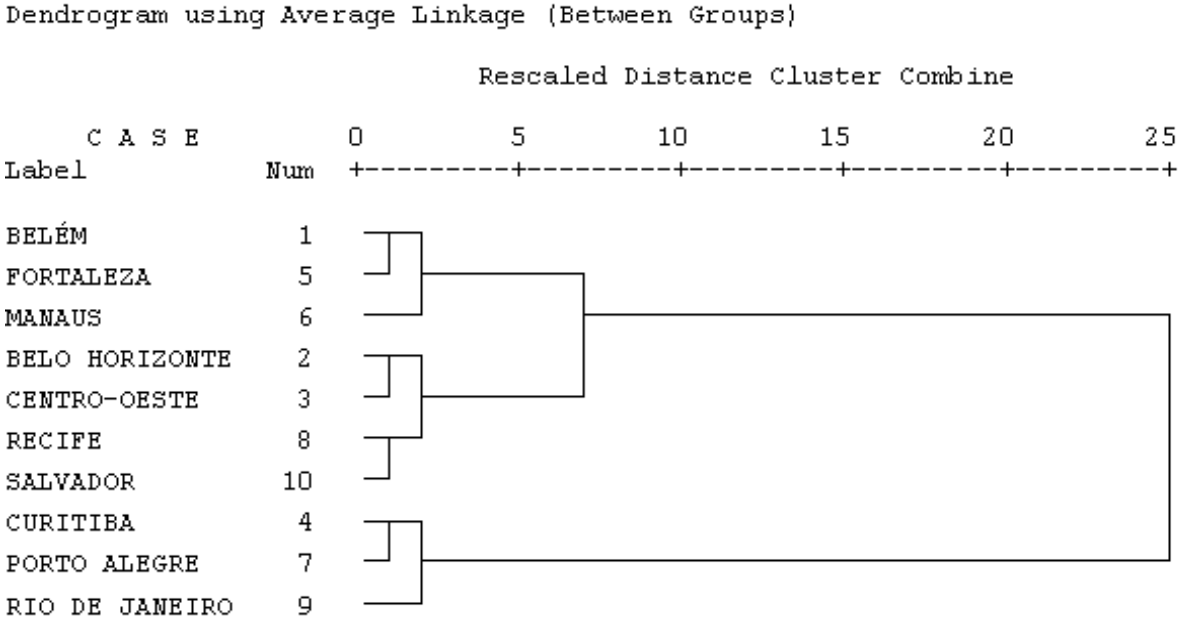
DENDOGRAM 7 for 1990



DENDOGRAM 8 for 1994



DENDOGRAM 9 for 2000



If we match the first cluster analysis made in this paper with this new one, we will see that each region now shows diferent characteristics that help to divide such regions inside their previous groups. It is seen that in the medium-high economic performance and medium-low PLP and BLP group occurred another division: the macroregions Curitiba and Porto Alegre got nearer Rio de Janeiro, improving their position. But by the other hand, the macroregion Belo Horizonte and Center-West got nearer Salvador and Recife, what means that they are presenting worse financial variables.

During the past years, the macroregions Recife and Salvador worsened their financial situation and formed a group separated from Belo Horizonte and Salvador, due to a higher increase in their BLP index (higher liquidity preference). The lowest economic performance regions remained toghether and formed two groups: a better one (lower liquidity preferences) with Fortaleza and Belém and other with Manaus (the worst according to the financial variables). What it is important here is that in all the analysis made we reached the same conclusion: that central and peripheral regional groups are formed according to the variables used and that regionalization confirms the empiric views.

IV. PRELIMINARY CONCLUSIONS

In view of the results of the statistical analysis, there is a clear division between central and peripheral regions: São Paulo and Rio de Janeiro are away from the other regions, followed by three medium groups – the first one formed by Belo Horizonte, Curitiba, Center-West, and Porto Alegre, the second by Salvador and Recife, and the third by the inclusion of Fortaleza and Belém. The whole group show a medium performance as a whole, but their financial and economic variables are opposite: the first group has a lower liquidity preference, better centrality and economic performance; the second and third group have poor economic performances and the difference between them consists in the liquidity preference index, with the third one showing higher PLP and BLP. The last region studied was Manaus, which is well far from the others with poor results for all variables.

From the geographical viewpoint, there is a clear centrality in the regional development which is perceived by the formation of development (rings) around the macroregion of São Paulo. These neighborhoods have São Paulo as the center and they visibly worsen towards the northwest, north, and northeast.

The regionalization proposed by Lemos *et al.* is comproved by the post-keynesian theoric frame.

Another inferred result is a clearly differential as for the agents' behaviour related to the financial variables. The public's attitude in the face of the financial world is different from the banking attitude; the public mainly reacts to the regional economic variations, by increasing or decreasing its liquidity preference, according to the economic dynamics in the regions it is located. The banking agents, however, present a behaviour proper of inflation times, called flexibility preference by PAULA (2001), as banks go on managing their portfolios in such a way as to present a high level of flexibility so that they may follow the economic scenario when abrupt changes occur. With such a role, the Brazilian banks do not behave as regional development funding agencies. The governmental banks still are the major responsible for the provision of *finance* for investment, acting as government intermediaries to foster the regions' development. In view of this fact, we can see two scenarios related to the participation of the banking system in the national economy: 1) private banks restrain their action to the great centers with increased competition, but with small effects on credit provisioning, since the high national interest rates encourage them to concentrate assets in their portfolios in such a way as to bring them higher yields, which excludes financing people and firms, and hence regional development; 2) government banks extend their action to the peripheral regions, filling up the banking gaps, and act as mere intermediaries of state funds and investment for these regions.

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