Banking, economic growth and industrialization: Brazil, 1906-30*

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This paper examines the Brazilian banking system from 1906 to 1930 in order to explore the connections between banking, economic growth, and industrialization. It finds that Brazilian banking behaved in manners that are predicted by theories derived from "developed" economies during similar periods of growth and industrialization. Banking was strongly integrated with the productive economy, as well as servicing the State's monetary needs. Further, the banking system was more directly related to industrial growth than to agriculture.

Este artigo examina o sistema bancário brasileiro, de 1906 a 1930, a fim de investigar os vínculos existentes entre bancos, crescimento econômico e industrialização. Conclui que os bancos brasileiros agiram da forma prevista por teorias originadas em economias "desenvolvidas" em períodos semelhantes de crescimento e industrialização. O sistema bancário não só estava fortemente integrado à economia produtiva, como atendia às necessidades monetárias do Estado. Além disso, estava mais diretamente relacionado com o crescimento industrial do que com a agricultura.

1. Introduction

Economic historians have often explored the means by which capital was accumulated and allocated to emerging industrial applications, and, specifically, the role of finance in that transition.[1] Early theoretical work suggested that patterns of both growth and industrialization could be substantively influenced by the presence of a dynamic banking system[2] (Schumpeter, 1911; Gerschenkron, 1962; and Cameron, 1967). Later work hypothesized that the increase of banking was a residual activity, which naturally resulted from a general increase in exchange transactions which occurred as a result of either growth or industrial development (Robinson, 1952). More recent research by development economists finds that, in the late twentieth century, the size of the financial sector, and specifically commercial banking, can explain past and predit future economic growth (King & Levine, 1992).[3]

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[1] Some of the most important early works on financial systems and economic development include Gerschenkron (1962); Cameron (1967 and 1972), and Crouzet (1972). Interesting case studies include Cottrell (1979), Hudson (1986), and Sylla (1972).

[2] Unfortunately, as Cameron (1967:1) notes "The causal nexus of this relationship is by no means clear (...) Does it run from financial institutions to industrialization or, on the contrary, does the process of industrialization throw up a wake of financial institution". The "causal nexus" of the relationship has not become clearer in the years since Cameron wrote his introduction.

[3] I am indebted to Nathaniel Leff for drawing my attention to this article.

The relationship between banking and economic development is under-represented in Brazilian economic historiography. Recurring financial crisis, the existence of a large modern industrial sector and the significant presence of the State in industrial production combine to make the question of historical financial development especially interesting. To the extent that it has been considered, the historiography suggests that during the period when industrial processes were firmly established, the financial system failed to support economic development within the private sector.[4] This assesment if based on analyses of monetary policy and the political economy.

This paper examines the banking system within the context of the Brazilian economy from 1906 to 1930. My goals are to identify the factors in the economy which were important for commercial banking and to examine the relationship between the banking system and economic growth during this early period of industrialization. The paper assesses the importance of banking within the productive sectors of the economy. The issues that are explored are the relative importance for banking of growth in the agricultural and industrial sectors, and the responsiveness of different types of banks to the private economy. In particular, the paper demonstrates that the public policy function of the Banco do Brasil strongly obscures the dynamic support by private banks to industrial development and growth.

The methodology of this paper adds an empirical dimension to the existing historiography of Brazilian banking. The data used are the balance sheets of the major foreign and domestic banks during the period, as published in their annual reports and the financial press.[5] These banks represented approximately 70 to 85% of total banking balances.[6] Their balance sheets have been aggregated, and the result is employed as a representation of the entire banking system. An extremely simplified econometric model for the demand and supply of bank deposits is specified in order to examine the relationship between the demand for banking and economic growth. By using these analyses and this methodology, this paper systematically explores issues which have been found important in other economies in the context of the modernizing Brazilian banking system.

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[4] On Brazilian monetary history, see Neuhaus (1974), Peláez and Suzigan (1981), and Villela and Suzigan (1975). For regionalized banking studies, see Saes (1986) and Costa (1978). The most important institutional studies of specific banks are Pacheco (1973) and Costa (1988). Research suggests that monetary, financial and industrial policies were often dictated by the federal State's immediate financial needs, in order to accommodate debt service and infrastructural investment obligations. Fritsch (1988) finds that foreign debt servicing requirements of the State were the motivating consideration for monetary policy, and Topik (1987) addresses the role of the financial sector in the political economy from the perspective of government institutions. Topik has found that, despite liberal presumptions, the national government pursued interventionist policies in many economic sectors, including finance. Peláez (1976) develops a strongly stated argument that monetary policies seriously impeded economic growth by destabilizing the economy and disadvantaging new activities (specifically, industrialization) through over-valued exchange rates. The works of Peláez and Neuhaus have been the most specific proponents of the hypothesis of an underbanked economy.

[5] The banks included in the data base were publicly chartered for at least a substantial portion of the period between 1906 and 1930. These banks were required to publish their balance sheets monthly in widely available newspapers and to issue annual reports of financial condition to shareholders. The most comprehensive source of this information is the *Jornal do Commercio*, the major business newspaper of Rio de Janeiro. The *Estado de S. Paulo* and the *Anuário Estatístico do Estado de São Paulo* provided additional data for some of the banks in São Paulo; regional sources were also used for banks in Minas Gerais. The data for the two Rio Grande do Sul banks are taken from Lagemann (1985); his sources are the *Anuário Estatístico* of Rio Grande do Sul and banks' annual reports.

[6] This estimate is based on the bank balances published by the Ministério da Fazenda (*Relatórios*, various issues) and republished in the *Retrospecto Commercial*. I have not used the data from these sources because they are not available for the entire period, and they are totally undocumented. The lack of documentation is especially problematic because, in some cases, the data appear to be collected inconsistently. Further, by collecting data on individual banks' balances, I retain the ability to define various subgroups of banks. For this work, I only consider cash (excluding interbank deposits) on the asset side of the balance sheet. For reasons of data consistency, I combine demand and term deposits. Commensurately, M_2 is the measure used for the money supply.

2. The banking system from 1906

During the first years of the Republic, Brazil experienced significant financial chaos.[7] A string of bank failures in 1900 and 1901 was the culmination of the preceding 15 years of confusion and instability, essentially leaving the economy with no organized banking system (Neuhaus, 1974:10-5, and Topik, 1987:36-8). After five years of financial stagnation, the banking system was substantially reformed in 1906. The most important feature of the reform was the opening of the Banco do Brasil. In many ways, the Banco do Brasil functioned as a central bank for the federal government. It was also the largest commercial bank for the private sector.[8]

The opening of the Banco do Brasil ushered in a period of stability and increasing responsiveness of the banking system to the private sector. The businesses and transactions in which banks engaged were very well defined.[9] Banks extended short term credit, which was protected by easily idenfied collateral. They funded their credit portfolios with (primarily) short term deposits, which could be withdrawn and for which they often paid interest. With the exception of the Banco do Brasil, banks engaged exclusively in local business. Only a few banks extended long term mortgages in order to finance real estate, and they were subsidized by state governments. Publicly chartered banks did not undertake long term lending not secured by real estate, such as that for industrial capital formation, or unsecured lending. However, these limitations did not result in insumountable constraints to their capabilities. Banks easily renewed credit on its expiration, effectively transforming short-term into medium and long-term capital. Borrowing based on personal creditworthiness and social relations easily funded many business undertakings.

Overall, the banking system grew rapidly after 1906, although individual banks exhibited widely fluctuating growth patterns and reflected the circumstances of their specific institutions and regions. The result of the difference in growth rates was that, after adjusting for price inflation, in 1930 the banking system was about nine times larger than it had been in 1906, while the economy was about two and a half times larger (see graph 1). Banks increasingly accumulated and re-allocated financial resources, at the expense of either personal or other institutional channels. The banking system responded actively to its economic environment.

Simultaneously with its progressive aspects, the banking system faced serious constraints. As a result of a decreasing need for cash holdings to protect against deposit withdrawals, banks could allocate a higher proportion of their available funds to credit. However, in the Brazilian case, the decline in the relative size of cash holdings did not reflect relatively more expansive credit policies by the banking system. Banks could increase their capacity to extend credit either by aggressively soliciting deposits or by incurring other forms of short-term debt. They did not aggressively expand their liabilities in order to create credit (Triner, 1994:39-41). The overall stability and non-expansive relationship between bank credit and

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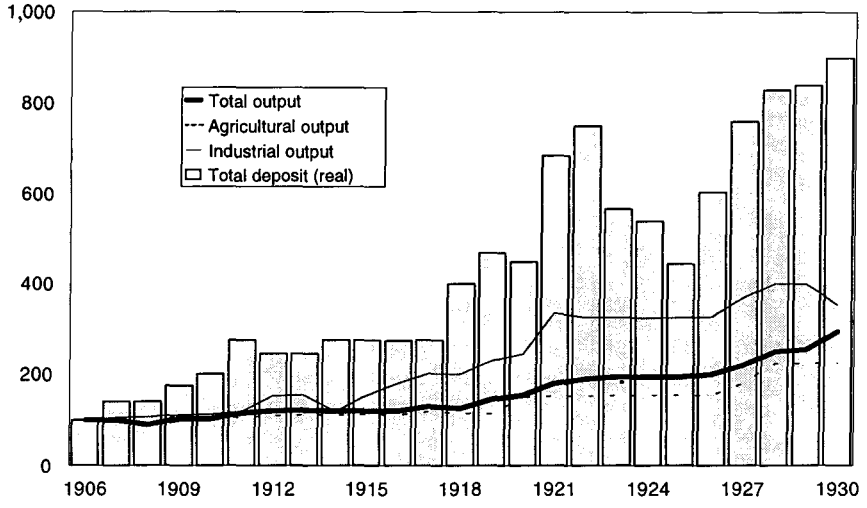
[7] The expansion (or inflation) from easy conditions for bank note issuance, initiated by the Banking Reform of 1888. Corporate formation and equity issuance were furthered in 1890 by the amendment of the Commercial Code (Leis nº 850 and nº 916). Little is understood about the causes, nature and economic effects of the first years of this period (the *Encilhamento*). The monetary policies of the *Encilhamento* have been the most analyzed aspect of the period (see Franco, 1983; Lobo, 1976; Levy, 1977 and 1980).

[8] From 1907 to 1930, the Banco do Brasil held between 10 and 37% of total bank deposits.

[9] The statutes incorporating the banks specify the definitive limits of banks business operations. See, for example: Banco de Crédito Hypothecário e Agrícola do Estado de São Paulo; Banco do Estado de São Paulo (*Estatutos*, 1909, 1925, 1926, 1927, and 1928); Banco de Crédito Real de Minas Gerais (*Estatutos*, 1889 and 1919); and Banco do Brasil (*Estatutos*, 1906, 1916, 1922 and 1932).

deposits suggest that either the demand for more expansive and risky lending did not exist or that the structural conditions to accommodate it were lacking. So, although the banking system executed an increasing share of the transactions undertaken by the economy, it did not create financial resources.

Graph 1
Economic growth and banking, 1906-30
Indices, 1906 = 100



Sources: Table 1 and Triner (1994, table A.3).

The banking system was usually the conduit for changes in monetary policy; and it was the linchpin between money, public finance, and the private productive sectors.[10] The federal government actively used the banking system, through the Banco do Brasil, to implement monetary policy and to distribute financial resources. Monetary policy fluctuated rapidly and severely in response to the government's financial needs and political goals. International debt obligations, the coffee commerce, and domestic agricultural and industrial production were of primary concern to the government at various times during the First Republic. Monetary policy, more than tax or budget policies, was used to intermediate these competing concerns. The use of the Banco do Brasil in monetary policy and to distribute financial services significantly affected the structure of the banking system (Triner, 1994, chapter 3). Most importantly, the government funded large expansions of money and credit through the Banco do Brasil. The most substantial change in the bank's role in the financial system was consolidated when it opened the Rediscount Office in 1921.[11] During the subsequent contractionary period, it was the Banco do Brasil, acting as the Central Bank but with the Rediscount Office closed, that effected the credit contraction. Overall, the government successfully used the bank to meet short-term monetary goals.

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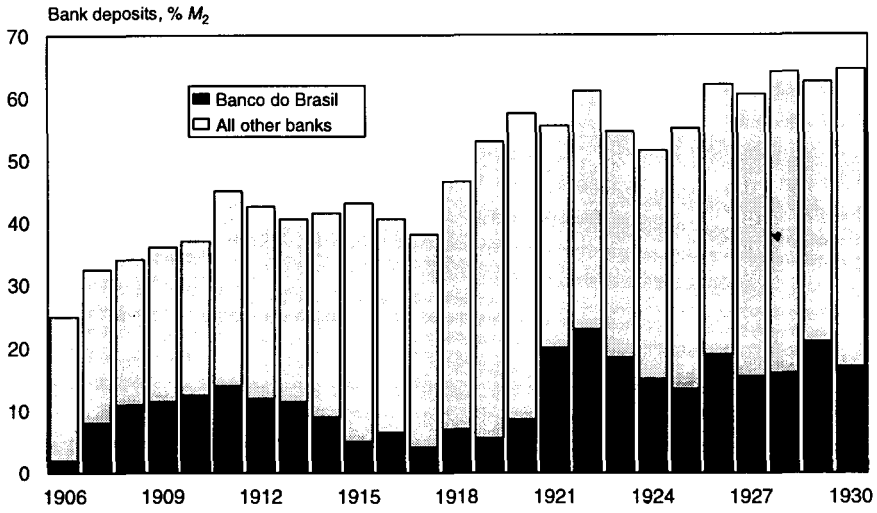
[10] The monetary and policy history of the events described in the following paragraphs can be found in Fritsch (1988), Topik (1987), Neuhaus (1974), and Peláez and Suzigan (1981).

[11] The Rediscount Office was institutionally housed in the Banco do Brasil. However, its operations were reported separately from the bank's commercial transactions. The balances reported here for the Banco do Brasil exclude Rediscount Office transactions. The actual success of the Rediscount Office for the economy, in contrast to the Banco do Brasil, will be considered later.

Graph 2
Banking in the monetary system: 1906-30



Sources: IBGE (1990, table 10.2), and Triner (1994, tables A.3 and A.5).

Independently of monetary management, the banking system became more tightly related to the productive economy during this period. The rapidly growing share of the money supply in the form of bank deposits was one of the strongest indicators of the increased importance of the banking system after its reorganization in 1906 (see graph 2).[12] The share of bank deposits in the money supply (M_2)[13] increased two and a half times, from 25% in 1906 to 62% in 1930. The increase of bank deposits in the money supply had three potential benefits for the economy. First, the increased size of the deposit base created a larger capacity for the banks to extend credit. Although these banks did not aggressively create it, credit increased in parallel with, and somewhat faster than, deposits. Second, the willingness to place deposits with banks, rather than holding currency as a store of resources, implied strengthening confidence in and stability of banking institutions. Third, having a larger share of money in the form of bank deposits improved the efficiency of commerce by settling a larger share of transactions within the banking system, whithout the actual exchange of currency or barter. Over the course of the period, the role of the banking system within the monetary system developed consistently. The ability of monetary authorities to control the money supply by managing the volume of currency diminished.

The traditional methods of monetary economics study the money supply by assessing the amount of currency in the economy and what is done with that currency.[14] Once currency is

[12] Kindleberger (1993, chapters 2 through 8) gives a clear discussion of the evolution of the role of banking deposits as an important feature of financial development in Western Europe.

[13] I have chosen to use M_2 as the measure of money supply, rather than the more commonly used M_1 (which excludes term deposits), because bank balance sheets reported total deposits more reliably and for a longer period than the separate categories. In practice, the measures would not yield significantly different results, since term deposits were held at a low level, during the periods for which we have information.

[14] Neuhaus (1974) has applied this methodology to the Brazilian monetary economy.

issued, it has two applications. It can circulate through the economy in the course of completing financial transactions, or it can be held by banks.[15] Analyses consistently demonstrate the increasing importance of bank deposits in determining the behavior of the money supply (Neuhaus, 1974, tables 27, 30 and 31; and Triner, 1994:132-40). However, this methodology does not take into account structural features of the productive sectors of the economy. The money supply analysis assumes that the factors explaining the demand for money were stable. There are strong reasons to suspect that substantive changes in the demand for money occurred during the period under consideration. One indication of a shift in demand for bank deposits is found within the money supply data itself. The secularly declining ratio of currency held by the public implies a shift of demand towards money in the form of bank deposits. Further, the compositional analysis of money supply ignores the effects of price inflation on the productive economy. Rapid price changes were common during the First Republic (see table 1). However, severe price changes affected the productive sectors through both actual fluctuations of prices and expectations of future change.

The increase of real bank deposits (adjusted for price changes), measured on a *per capita* basis, is a strong indication of the increase in financial resources channeled through the banking system and a shift in the demand for money. Research on the role of banking in the growth of other economies finds the spread in the use of banking among a wider proportion of the population to be important in generating and sustaining growth (Cameron, 1972:296-303, and Goldsmith, 1969:373-5, 390-4). Brazilian historiography presumes the economy to be "underbanked"; at similar levels of *per capita* income, other "developed" economies had larger banking systems (Topik, 1987:52, and Peláez, 1976).[16] There is no reason to dispute this suggestion. However, when considering the rate of change, rather than the absolute level, the increasing involvement of the banking system in the economy during the early 1900s is impressive (see graph 3).[17]

The volume of real deposits *per capita* increased 5.4 times between 1906 and 1930. The comparable factors of increase for income *per capita* and the population were 2.1 and 1.6 times respectively. (The rapid increase in deposits *per capita* from 1921 to 1923, with an even more severe contraction from 1923 through 1926, clearly reflects the monetary policies of these periods, and was anomalous in the overall trend.) Although the paucity of information on the distribution of income and bank deposits among the population[18] severely constrains the use of these data, this information confirms that the total pool of resources in the formal financial system increased much more rapidly than did population.

Significant variation in the growth rates of different sectors of the economy further suggests shifts in the demand for bank deposits. The emerging consensus among economic his-

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[15] The theory and methodology of the analysis were originally specified in Friedman and Schwartz (1963). Simplified specifications of it can be found in Rockoff (1972) and Neuhaus (1974, appendix C).

[16] Data are not available to support strict comparisons of either income or bank deposits, measured on a *per capita* basis.

[17] The data on output and prices are from IBGE (1990, tables 4.1 and 5.2) and Haddad (1974, table 1). These data (especially those of Haddad) are very imperfect. They are well-critiqued in the introductions to the respective IBGE (1990) chapters. (See also Catão, 1992, for a critique of the price indices.) I have chosen to use them for two reasons. First, they are the best information available. Second, I employ the rates of change derived from the original data, rather than their absolute levels. While this is, of course, also imperfect, the direction and general magnitude of annual change are perhaps easier to determine than the absolute levels.

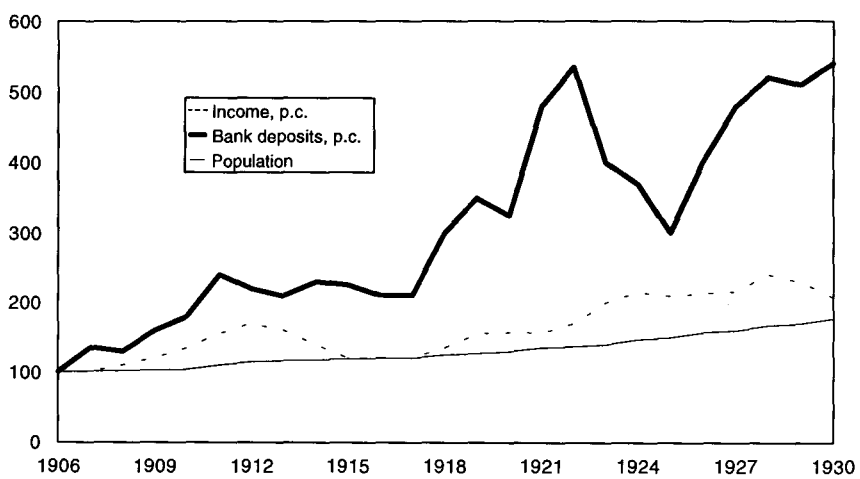
[18] The reader should not conclude that the reason the level of deposits per person increased more rapidly than *per capita* income was that banking services were spreading among the population. As with the measure of income, deposits measured on a *per capita* basis have a fairly limited use. These statistics do not reveal anything about the distribution of either income or deposits among the population; nor do data exist to address this issue.

Table 1
Economic indicators, 1906-30

Year	Output			Implicit price deflator			Price index (1906)
	Total	Industry	Agric.	Total	Industry	Agric.	
1906	24.8	13.6	33.3				100.0
1907	25.0	14.8	39.4				106.1
1908	24.2	14.8	36.5	40.0	35.6	38.4	111.3
1909	26.7	18.0	36.6	39.3	36.2	37.2	109.4
1910	27.4	18.8	38.2	41.0	40.0	38.7	114.1
1911	29.0	20.5	36.7	41.9	32.1	43.3	116.6
1912	31.0	22.7	39.4	45.1	38.1	45.3	125.5
1913	31.9	22.9	41.1	40.0	35.0	39.5	111.3
1914	31.5	20.9	41.5	34.7	29.0	34.6	96.6
1915	31.6	23.6	43.2	39.3	37.9	36.0	109.4
1916	31.9	26.3	42.0	47.5	44.7	44.2	132.2
1917	34.9	28.6	47.0	51.7	63.7	39.1	143.9
1918	34.2	28.3	43.5	56.0	56.6	47.6	155.8
1919	36.9	32.5	44.8	60.9	56.8	59.7	169.5
1920	41.5	34.2	53.3	72.5	66.8	74.1	201.7
1921	42.3	33.6	55.5	61.4	52.4	61.4	170.8
1922	45.6	39.9	55.8	67.0	54.1	70.7	186.4
1923	49.5	45.2	58.0	87.2	75.1	96.2	242.6
1924	50.2	44.7	58.6	96.8	71.3	115.4	269.3
1925	50.2	45.2	56.7	114.6	88.1	135.9	318.9
1926	52.8	46.3	58.5	93.9	81.7	101.9	261.3
1927	58.5	51.3	64.8	91.8	77.2	100.8	255.4
1928	65.2	54.9	76.7	102.4	85.1	113.8	284.9
1929	65.9	53.7	76.9	98.7	78.5	110.4	274.6
1930	64.5	50.1	77.8	86.5	64.9	96.2	240.7

Sources: Output, IBGE (1990, Table 4.1); industrial and agricultural output, Haddad (1974, table 1); implicit price deflators, IBGE (1990, table 5.2).
Notes: Output indices and price deflators, 1939 = 100. Price index, 1906, combines Catão (1993) index for 1906 and 1907 with IBGE index; all prices set to 1906 = 100.

Graph 3
Deposits and income, *per capita*
Index 1906 = 100, real level



Sources: Triner, 1994 (table A.3); Contador and Haddad (1975, app. tables C-1 and C-2).

torians who have studied Brazilian industrialization is that industrial processes were firmly implemented during the First Republic. During and after World War I, the dynamics which determined the course of industrial growth shifted from the agricultural export sector to the domestic economy.[19] Even so, the process of industrialization did not quickly result in high levels of manufactured output. By the end of the First Republic, industrial output was still relatively low and represented a small share of the total economy.[20] Nevertheless, the rates of growth of the two sectors differed significantly, and a perceptible shift occurred away from agriculture and toward industrial manufacturing in the composition of output. Between 1906 and 1930, estimated industrial output increased by a factor of slightly more than three and a half times, while agricultural production increased approximately 2 1/3 times (Haddad, 1974, table 1).[21] An increasing proportion of resources was applied to factory production of goods. Economic historiography of Europe and the United States suggests that industrialization is associated with changes in the demand for money, and more specifically with the demand for banking.[22]

The comparison of growth in the banking system with the increase of production further demonstrates the heightening importance of the banking system in the economy. Between 1906 and 1930, growth patterns of banking and production were increasingly disparate. Total output of the economy and its industrial production increased by factors of approximately two and a half and three and a half times, respectively, while real deposits in the banking system grew by a factor of approximately nine (see graph 1). The banking system executed a

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[19] W. Suzigan (1986) provides a good discussion of the historiography of Brazilian industrialization.

[20] Gross domestic product data are not available prior to 1947. However, if we apply the indices which are available for production (IBGE, 1990, table 4.21, and Haddad, 1974, table 1) from the 1900 to the 1947 GDP data, we can derive an estimated composition of output for the earlier years. By this method, we calculate the percentage shares of GDP to industry and agriculture, with the balance being taken up by the public sector, infrastructure (such as transportation and construction), mining and services:

	% of GDP	
Year	Agriculture	Industry
1900	39.3	13.0
1930	30.6	16.5

While this methodology could not be used for precise quantitative analysis, it does make clear that (even allowing for huge statistical error) industrial output was not high during the First Republic, despite a shift in that direction.

[21] If an index of production is derived from the Haddad data, with 1906 set as the base year, industry reached 368 in 1930 and agricultural output was 234.

[22] J. Schumpeter (1911) was perhaps the first to specifically hypothesize a direct link between bank credit and economic growth. Cameron (1967) is the major source which specifically assesses the role of banking in countries which have successfully industrialized. Many theoretical studies on economic growth consider the role of the financial sector, drawing upon the experiences of industrialized economies; major examples are Crouzet (1972) and Gerschenkron (1962). Many possibilities have been found for the influence of banks on the course of development. For example, Cameron finds for France that the inability to create responsive and expansive banking institutions slowed the growth of national income and may have hindered growth and industrial finance (Cameron, 1967, chapter IV and chapter VI [by Tilly]). He also finds that banks were effective in capturing and allocating resources in German industrial development, with the active participation of the state, and German banks contributed significantly to large scale industrialization. In more regional studies, Lamoreaux (1986) looks at the social networks affecting the formation of early New England banks; and Hudson (1986) finds that Lancashire textile manufacturers successfully used short-term credit for medium and long-term finance. As Cameron concludes, "banking systems are not neutral with respect to economic development" (1972:24).

substantially larger proportion of the economy's financial transactions and supported overal-leconomic growth by creating formal chanells for the flows of funds.[23] Therefore, explaining the banking system solely in relation to monetary factors is insufficient. A further examination of the relationship between banking and the productive sector is necessary.

3. The model

In order to determine the relationship between the banking system and the real economy, a very simple model has been specified to estimate demand and supply functions for changes in the volume of real bank deposits (following Sushka, 1976). The bases for this model are the elementary principles of economic theory that supply and demand are (different) functions of quantity and price, and that supply of real deposits equals their demand. Changes in the volume of demand for real bank deposits can be expressed as the result of changes in income (quantity) and interest rates (price). Fluctuations of income, measured as the annual percentage change of output, are expected to result in changes in the demand for real deposits in the same direction. In the absence of interest rate data, I use the rate of change in the price level to approximate the effect of deposit price change. The demand for real deposits is expected to be inversely related to prices. As its price increases, the demand for money, in the form of deposits, should decline. Idle funds on deposit in banks carry an increased opportunity cost to depositors as interest rates increase, and alternative investments earn higher returns. That is, at a higher price, depositors are expected to direct funds toward more profitable uses than bank deposits. Reduced borrowing is one of the important alternative uses of funds during periods of increasing interest rates since interest rates for deposits change less and more slowly than loan rates. Obviously, in a scenario of declining prices (and interest rates), the inverse dynamics is expected to hold, with the result of increased demand for bank deposits.

Further, it is hypothesized that the fluctuation of the supply of real bank deposits is a positive function of their price, reflecting the benefit to banks of increasing size as interest rates increase. An increasing deposit base translates into higher profits during periods of rising prices for money, again assuming that the cost of attracting deposits increases less than the interest rate that can be earned on credit.[24] The fluctuation of bank cash balances should also move in the same direction as deposits since banks hold cash reserves primarily in order to redeem deposits.

Theses concepts can be specified as:[25]

$$Dep_D = a_1 + b_1 Y + B_2 P \qquad b_1 > 0; b_2 < 0 \qquad (1)$$

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[23] It is theoretically possible that cash transactions and credit operations were simply transferred from informal sources to banks, without the banking system being responsible for the creation of additional credit in the economy. Given the order of magnitude of the growth rate differentials, however, this would be a very difficult hypothesis to accept.

[24] This is a realistic assumption in banking generally, and for Brazil during the First Republic.

[25] The model uses the contemporaneous variables, and does not incorporate lagged estimates. The extent of fluctuation, especially for prices, was sufficient that the rate of change in a prior year's measure would not generate expectations of continuation of change at the same rate, or even in the same direction from one year to the next (see table 1). Tests of regressions including the lagged variables confirmed that they were not statistically significant in explaining the succeeding year's rate of change.

$$Dep_s = a_2 + b_3C + b_4P \qquad b_3 > 0;\ b_3 > 0 \qquad (2)$$

$$Dep_D = Dep_s$$

where:

Dep_D is the demand for real bank deposits, annual percentage rate of change;

Dep_s is the supply of real bank deposits, annual percentage rate of change;

Y is the output, annual percentage rate of change;

P are the prices, annual percentage rate of change;

C are the real cash balances, annual percentage rate of change.

The demand side is of most interest for the questions are raised here about the relationship between the productive economy and the banking system. Therefore, this model is most useful for estimating the demand of deposits; and this paper emphasizes the demand equation when analyzing its results.

An advantage of this specification is that it allows for a certain amount of disaggregation. The model measures the responsiveness of the total banking system to major overall economic variables. Since income and price series for the industrial and agricultural sectors are available, the model can also test whether the banking system responds more strongly to one sector or the other. This provides a succinct test for our hypothesis of the relationship between banking and industrialization. In addition, the bank data can be disaggregated by various geographic and structural features, and the model can be used to test whether banks with certain characteristics were more or less responsive to different economic variables. The privately-owned domestic banks, the banks located in São Paulo,[26] and the Banco do Brasil have been assessed. By isolating the private domestic banks, the dynamics of banking, as distinct from the effects of monetary policy effects through the Banco do Brasil, become more clear. An analysis of the banks in São Paulo, where both total economic growth and industrialization were most dynamic (Dean, 1969, and Cano, 1977), further demonstrates the relationship between banking and the productive economy. The extent to which the supply and demand functions for bank deposits in São Paulo and in the country differ indicates both the extent of economic integration among regions and the influence of paulista dynamism on the banking system.

This model of the banking system also has some drawbacks which need to be recognized when assessing its results. The first is its simplicity. In an economy with price fluctuation as rapid and severe as that experienced during the First Republic, both experience and economic theory support the expectation that prices and nominal interest rates moved together, and that fluctuations in prior years would have little effect on the current year, or on price expectations for the current year. The rate of change of prices reflects fluctuation of nominal interest rates (as compared to real interest rates); therefore, the rate of price fluctuation captures the change

[26] The paulista banks include both foreign and domestic institutions, plus the Banco do Brasil facilities in the state of São Paulo. Although this creates some overlap with the group of private domestic banks, it identifies a group of banks which may be distinctive. The regression results indicate no statistically significant differences.

in the opportunity cost of holding deposits. Nevertheless, the absence of a time series of interest rate data is unfortunate. Further, the model incorporates only three variables: income, prices and cash balances. A wide variety of exogenous variables may be missing from the model which could be important in explaining the growth of the banking system. The statistics which measure the reliability of the regression statements can reveal whether variables are missing, but they do not identify what those variables are. Some likely factors which are not included in the equations are the requirements of international debt servicing and international trade, and the funding policies of the state and Federal governments. Another drawback of this model is that it assumes that the direction of causation is from the economy to the banking system. This model specifies that growth of banking is a result of economic change. It does not take into account the likelihood of two-way causation. That is, growth of the banking system could have an effect on the fluctuation of output or prices. While the regression statements measure the statistical relationship between the variables, it should be recognized that causation probably ran in both directions. Econometric tests to determine the antecedence of banking or output growth (if not the direction of causation) yield indeterminant results, supporting the assumption of two-way causation.[27]

The model is a set of two simultaneous equations (equations 1 and 2) which estimate the same variable, the change in the volume of real deposits. One independent variable, prices, appears in both equations. Because of the simultaneity problem, the two statements cannot be estimated independently of each other. These equations have been solved by using two state least squares estimations; and price level changes are determined endogenously in the first stage.[28] Table 2 shows the estimated demand functions for the change in the volume of bank deposits and table 3 gives the supply functions.

The statistical integrity of the results for the model is sufficient that they can be usefully analyzed. In most instances, the results are statistically valid.[29] The comparison of when these regressions generate statistically significant information (and when they do not) also reveals useful findings. The directions of correlation are as expected, with the important exceptions of the functions using agricultural output to estimate deposits and when the population measured was the Banco do Brasil.

4. Empirical findings on banking and economic growth

The rates of change in total prices and output explains 39% of the rate of change of real deposits for the entire banking system (as measured by R^2). Although the direction of correlation between changes in output and real deposits is in the expected direction, the probability that the coefficient associated with the change in output is valid falls below the acceptable range.[30] The proportion of real deposit growth explained by the independent variables increases slightly, from 0.39 to 0.42, when the change of industrial output and prices replace

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[27] Granger-Sims tests, to determine the antecedence of banking or income growth, give indeterminant results. In these tests, the rate of change of real deposits is regressed, for four lagged periods, on itself and the change in output.

[28] Reduced form estimates yield consistent results. This procedure also accounts for the conformity of the reliance statistics (R^2, F-estatistic, and Durbin-Watson).

[29] The statistics measuring auto-correlation (Durbin-Watson), and the probability that the independent variables (t-ratios) and the dependent variables (F and significance of F) are statistically valid within acceptable ranges.

[30] As indicated by the absolute value of the t-ratio of less than approximately 2.

Table 2
Demand functions for change of real bank deposits
1907-30

Independent variables	Total Brazil		Private banks		Paulista banks		Banco do Brasil	
	Coefficient	*t*-ratio	Coefficient	*t*-ratio	Coefficient	*t*-ratio	Coefficient	*t*-ratio
Constant	0.15	(3.31)	0.13	(4.01)	0.12	(3.02)	-0.22	(-.52)
Total prices	-1.95	(-3.63)	-2.23	(-6.91)	-3.78	(-6.76)	39.12	(1.96)
Total output	1.11	(1.38)	1.87	(3.36)	3.80	(5.38)	-28.58	(-2.16)
R^2	0.39		0.70		0.71		0.19	
F	6.61		24.29		25.50		2.45	
Sig. *F*	0.01		0.00		0.00		0.11	
Durbin-Watson	2.20		1.86		1.76		1.83	
Constant	0.07	(1.54)	0.07	(2.24)	0.01	(.39)	-0.09	(-.28)
Ind'l prices	-1.74	(-3.94)	-1.87	(-7.01)	-2.33	(-6.92)	-18.17	(-2.03)
Ind'l output	1.98	(2.97)	2.17	(5.04)	3.32	(6.26)	19.41	(1.84)
R^2	0.42		0.70		0.71		0.18	
F	7.75		24.62		25.78		2.27	
Sig. *F*	0.00		0.00		0.00		0.13	
Durbin-Watson	2.20		1.76		1.39		1.83	
Constant	0.23	(4.59)	0.25	(7.34)	0.43	(7.41)	-1.02	(-1.73)
Agric. prices	-2.03	(-3.64)	-1.98	(-6.92)	-4.94	(-6.61)	19.37	(2.23)
Agric. output	-0.27	(-.56)	-0.64	(-1.83)	-1.32	(-2.91)	6.22	(2.19)
R^2	0.39		0.70		0.68		0.23	
F	6.61		23.94		21.97		3.08	
Sig. *F*	0.01		0.00		0.00		0.07	
Durbin-Watson	2.20		1.79		1.64		1.98	

Data sources: table 1 and Triner (1994, tables A.3-A.7).
Notes: All variables are measured as annual rates of change. Deposits are deflated for price level changes. $N = 24$, in all cases.

Table 3
Supply functions for change of real bank deposits
1907-30

Independent variables	Total Brazil		Private banks		Paulista banks		Banco do Brasil	
	Coefficient	*t*-ratio	Coefficient	*t*-ratio	Coefficient	*t*-ratio	Coefficient	*t*-ratio
Constant	0.06	(.63)	0.03	(.47)	-0.02	(-.39)	0.33	(1.09)
Total prices	0.05	(.04)	0.39	(.54)	1.22	(1.51)	-3.21	(-.58)
Real cash balances	0.59	(1.38)	0.60	(3.36)	0.72	(5.38)	0.80	(2.16)
R^2	0.39		0.70		0.71		0.19	
F	6.61		24.29		25.50		2.45	
Sig. *F*	0.01		0.00		0.00		0.11	
Durbin-Watson	2.20		1.86		1.76		1.83	
Constant	0.01	(.26)	0.04	(1.06)	0.02	(.46)	0.21	(.99)
Ind'l prices	0.65	(1.19)	0.22	(.71)	0.50	(1.57)	-0.46	(-.22)
Real cash balances	0.88	(2.97)	0.57	(5.04)	0.67	(6.26)	0.75	(1.84)
R^2	0.42		0.70		0.71		0.18	
F	7.75		24.62		25.78		2.27	
Sig. *F*	0.00		0.00		0.00		0.13	
Durbin-Watson	2.20		1.76		1.39		1.83	
Constant	0.07	(.26)	0.08	(.93)	0.04	(.40)	0.94	(1.42)
Agric. prices	-0.06	(-.02)	-0.27	(-.29)	0.09	(.06)	-15.04	(-1.18)
Real cash balances	0.56	(.56)	0.44	(1.83)	0.57	(2.91)	1.43	(2.19)
R^2	0.39		0.70		0.68		0.23	
F	6.61		23.94		21.97		3.08	
Sig. *F*	0.01		0.00		0.00		0.07	
Durbin-Watson	2.20		1.79		1.64		1.98	

Data sources: table 1 and Triner (1994, tables A.3-A.7).
Notes: All variables are measured as annual rates of change. Deposits are cash are deflated for price level changes. $N = 24$, in all cases.

total output and prices. The responsiveness of the demand for real deposits to output is about the same to the fluctuation of either industrial or total production (as indicated by the absolute values of the coefficients). These results suggest that industrialization may not have affected the growth of banking more than agriculture or other sectors.

However, comparing the separate influences of industry and agriculture, a very different conclusion emerges. Industrial and agricultural price fluctuations appear to have similar effects on the banking system. The price indices for both sectors are negatively correlated with the change in real deposits; and they have comparable coefficients and statistical reability (*t*-ratios). The important difference in results appears in the response of bank deposits to changes in the level of output. Bank deposits do not respond to changes in the level of agricultural production as predicted. Their correlation is in the wrong direction (negative, except for the Banco do Brasil) and is not consistently significant. In sharp contrast, real bank deposits are positively related to changes in industrial output. The results for the industrial output variable are consistent and statistically significant. The banking system responded more strongly and consistently to industry than to agricultural production. The rate of growth of the banking system is significantly correlated with the fluctuation of industrial prices and industrial output. This finding confirms that, although direct bank credit to industry faced constraints, demand for banking was strongly related to real industrial growth.

Weaker results for the agricultural sector are consistent with the expectations underlying the model for a variety of reasons. First, two significant variables that are related to agriculture are not included in the model: weather and government price supports.[31] Further, in the short term, the ability to affect agricultural output was much less than the ability to affect industrial production. That is, the crop cycle and land use requirements of agriculture may have necessitated a longer period before output could adjust to economic circumstances than was the case in industry.[32]

Also consistent with this paper's hypotheses are the results by sub-groups of banks. The demand functions for real deposit growth among the private domestic banks and the banks in São Paulo yield stronger regressions than those for the total banking system in two senses. First, the price and production fluctuation variables explain almost twice as much of the rate of change of real deposits as they do for the total banking system.[33] Second, the relationship between change in the volume of real deposits and output is stronger for these sub-groups than for the banking system as a whole. That is, the responsiveness of real deposits to output is larger for private and paulista banks (the absolute value of the coefficient), and the relationship is more statistically reliable for these banks (the *t*-ratio). The banking institutions which focussed their business on the private sectors were very responsive to the level of industrial production.

The explanatory value of the regression results (R^2) is approximately equal for the paulista and the private domestic banks nationally. The responsiveness of the paulista banks to price and output fluctuations is somewhat stronger than for the private domestic banks nationally, as demonstrated by the absolute value of the coefficients for the independent vari-

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[31] Coffee price support programs often significantly distorted the relationship between price and quantity of coffee (Topik, 1987, chapter 3). Other price support programs for rubber and other export products were also effective at various times during the First Republic.

[32] This was certainly the case for coffee; the bushes have a five-year gestation period.

[33] The R^2 increased from 0.39 for the total banking system to approximately 0.70 for all calculations of the private domestic and São Paulo bank regression statements.

ables. Increased responsiveness holds for all sectorial applications of the variables (total, industry and agriculture). Even so, the similarities of the regression statements for the paulista banks and the private banks nationally suggest that regional economic integration into a national economy, or at least a nationally consolidated banking system, had reached a substantial level. The difference in the regression results between the banks in São Paulo and private banks nationally is not sufficient to conclude that fundamentally different factors explained their growth. This finding conflicts with much Brazilian historiography, which assumes significant autonomy between economic regions.[34] The results for the supply functions among the sub-groups identified are closer than those for the demand functions, further reinforcing the conclusion of commonalities in the economic factors affecting the national banking system (see table 3). While fluctuations, type of economic activity and some economic regulation may have been regional in nature, these results indicate that local banking responded in similar manners to economic change across regions, and the banking system responded to a national economy.

Varying economic dynamics affecting foreign and domestic banks may explain part of the differential in the real demand for deposits between the private domestic banks and the total banking system. Foreign banks, which are included in the total, focused their business on the needs of foreign companies in Brazil, and needed to demonstrate profits in the currency of their country of origin (Triner, 1994:50-4). As a result, the fluctuation of the exchange rate would be of greater importance to the foreign banks.[35] However, the business of foreign banks and the structure of their balance sheets were not sufficiently different to explain such a large differential in the factors determining their growth, especially given their declining importance in the banking system.

The Banco do Brasil is the major difference in the population of these sets of regressions. Its position in the banking system explains the differing results. The bank's simultaneous roles as central monetary authority and largest commercial bank for most of the period suggest that the Banco do Brasil may have been subject to a unique set of influences on its growth. The regression results for the bank confirm that the factors determining the Banco do Brasil's growth are significantly different from the rest of the banking system. The model explains a much smaller share of growth for the Banco do Brasil than for the other groups (measured by R^2). In addition, the influence of the price and output variables is often in opposite directions from other banks, and the coefficients are larger (with lower reliability), than is the case for the other groups of banks. The Banco do Brasil's balances fluctuated more than other banks, but were not as responsive to the private economy. The difference in the results suggests that other factors (not included in the model) were important in explaining the Banco do Brasil's growth. In its private sector commercial banking activity, the Banco

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[34] The category "foreign" is not as clear-cut as the term implies. For example, the Brasiliensche bank für Deutscheland, was organized with German equity, managed by German nationals, and primarily financed German-Brazilian commerce, but operated only in Brazil; it is considered a foreign bank. The London & Brazilian Bank, whose shares were quoted on the Rio de Janeiro Bolsa de Valores, is considered a foreign bank for similar reasons of management, client base and the source of equity. However, foreign equity originally capitalized both the Banco de Crédito Hypothecário e Agrícola de São Paulo and the Banco de Crédito Real de Minas Gerais; and French nationals initially managed both banks. They are considered as domestic banks, both for the purpose of this study, and in the way were viewed during the First Republic.

One of the major themes of Cano's work (1985) has been the lack of integration between São Paulo and the rest of the economy. This theme as not been challenged by subsequent work.

[35] Alternative specifications of the regression tests confirm the heightened importance of the exchange rate for foreign banks.

do Brasil participated in the same markets as the private banks. Therefore, it probably was not diverted by a distinct set of market forces, and the difference in the regression results are attributed to the influences of its role as a monetary autority.[36]

5. Conclusion

The model of Brazilian banking developed in this paper yields useful information about the relationship between growth of banking and growth in the productive sectors of the economy. Variables which may add to the regression analysis are not tested; and the construction of the model is constrained by the data which are available. Notwithstanding these concerns, the regression analysis estimates results which are both statistically significant and logically consistent with the hypotheses underlying this paper. By employing an empirical model based on individual bank data, it is possible to demonstrate that different types of banks responded to varying factors. Among private banks, regional differences appear less than would be expected from existing historiography. Although it merits further examination, these results also suggest that a consolidated national banking system may have been forming more firmly than previous historiography recognizes. More importantly, the findings strongly support the existence of a relationship between the banking system and industrial growth. Improved regression results when using the price and output fluctuations in industry rather than in agriculture, and the strong relationship found for the private domestic banks and banks in industrializing São Paulo provide statistical confirmation of this relationship. This experience is consistent with the industrialization experiences of other economies (see footnotes 1, 2 and 4 above).

As the non-bank public used banks increasingly, and banks decreased their reserves of cash balances (as a sign of increasing stability), the ability of monetary authorities to control the money supply only with the tool of managing the volume of currency was increasingly difficult. Monetary authority was often exercised through the Banco do Brasil during this period. The bank's role combined with its size probably was important in determining the structure of the banking, and in masking the dynamism of the other banks. Nevertheless, the banking system developed in conjunction with both the monetary and real sectors of the economy during the First Republic to actively and efficiently support the reallocation of capital from agricultural to industrial uses.

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[36] This challenges one of the important assumptions of the construction of Neuhaus's money supply analysis. Neuhaus (1974, appendix B) specifically considered the Banco do Brasil as a commercial bank rather than monetary authority. The result for the analysis of the composition of the change of the money supply in the early portion of this chapter would be to increase the importance of the banking ratios in the composition of the money supply increases, since the private domestic banks had more consistent declines of their cash-to-deposit ratios than the Banco do Brasil.

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