INVESTMENT AND FINANCING IN BRAZIL IN ABNORMAL TIMES

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Summary: Introduction; I. The Brazilian Economy, 1990 – 1994; II. The Investment Empirical Models; III. Financing in Brazil; IV. The Model; V. Results and Final Observations; References.
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Abstract
This article concerns the financing of firms in Brazil in the first half of the 90s. Since the historical importance of self-financing for Brazilian firms is known, we aimed at identifying financing sources for investment spending from 1990 to 1994 based on a sample of 596 firms. The firms which form the sample are classified as large firms (155) and small and average firms (441) from the industrial, commercial and service sectors, totalling 596 firms. We end the article with two conclusions: one theoretical and the other empirical. The former concerns the choice of the most suitable investment model to be applied to the SERASA sample; the latter is about the evidence gathered in earlier studies made in either Brazil or internationally.

Introduction

This article concerns the financing of firms in Brazil in the first half of the 90s. Since the historical importance of self-financing for Brazilian firms is known, we aimed at identifying financing sources for investment spending from 1990 to 1994 based on a sample of 596 firms.

We used an investment model developed by Fazzari & Petersen (1993) which revealed, when applied to either the American economy or other economies, the importance of internal financing as an empirical proof of the information asymmetry hypothesis. In this study, we approached the financing-investment relation by investigating the resources which Brazilian firms invested from 1990 to 1994, a period that was marked by great transformations in the regulatory environment.

The methodology was as follows: an outline of the Brazilian economic context in the beginning of the 90s; a survey of investment theory to evaluate which model should be tested in Brazil; financing in Brazil; presentation of the model chosen; and results and final observations.

With the support of the methodological discussion and collected evidence, we end the article with two conclusions: one theoretical and the other empirical. The former concerns the choice of the most suitable investment model to be applied to the SERASA sample; the latter is about the evidence gathered in earlier studies made in either Brazil or internationally.

I. The Brazilian Economy, 1990 - 1994.

The changes in the Brazilian economic and political contexts in the beginning of the 1990s constitute the essential basis for this investigation into both financing and investment behavior, mainly because investment rates at that time had become almost exclusively dependent on the private sector whose decisions are susceptible to future economic conditions. In contrast with private sector decisions, the public sector sets in motion investments established by developmental policies which stimulate private sector decisions, since public spending is one of the components of effective demand. As a result of reduced State investment after 1980, private investment lost what had been its safeguard afforded by what was now past market logic. At this point, private decision revealed its flexibility, enabling it to either respond immediately to or wait for opportune.

The beginning of the 90s was marked by total restructuring of the financing logic of private productive investment, since the trade liberalization initiated by the Fernando Collor administration had not been balanced by the creation of any policy, even for credit, favoring national industry. Notwithstanding deliberations about the benefits of an industrial policy and the costs of protectionism, pressures on Brazilian firms by their competitors resulted in bringing to the surface an underlying tension

between stabilization and the maintenance of financing capacity in an environment of credit scarcity, such as that of 1980 through 1994. The rupture with the state financing standard and intervention that had been the foundation of the Brazilian credit system forced firms to continue self-financing.

The financing pattern, until the end of the 70s, included both state and foreign savings in order to finance productive activity. Decisive State participation, through public savings and protectionism policies, combined with foreign savings, characterize a very common type of financing from the beginning of Brazilian development. The entire process was referred to as Brazilian National Developmentism. Thus, the change in the nation's industrial financing pattern between the 1970s and the 80s represented a marked departure.

In the 80s, the State abandoned development plans, limiting itself almost exclusively to stabilization policy formulations and structural adjustments. While private sector savings grew, public sector savings declined. In the 90s, the changes which had occurred in the previous decade, in which State participation in the total savings was negative, were consolidated. The investments which depended on the government in the 70s were greatly reduced in 1980, recovering only from 1994 on.

Table 1. Investment Average (% of GDP)

YEAR	Private Investment	State Investment	Total
1975-79	15.6	10.2	27.2
1980-84	11.1	8.5	19.8
1985-89	12.3	9.4	21.7
1990-94	14.9	5.5	20.4

Investment fell off the public sector agenda – with the simultaneous loss of State investment capacity – while currency weakness, always a decisive factor for the private sector, became strategic from 1990 on. The economy then began to feel the impact of important changes, principally fiscal adjustment, trade liberalization, and high interest rates, which provoked a recessive effect on the economy mainly from 1990 to 1992. National industrial production, according to IBGE data and based on the fixed-base index, decreased about 18.13% between 1989 and 1992, and 8.71%

between 1989 and 1993, recovering only in 1994, when it reached the same values as in 1989.

Industry recovered in 1994, in spite of the trade liberalization policy which drastically reduced average import duties. This policy, used as a competitive tool, strained the self-financing capacity of business in general, limiting price increases of national products. Firms needing credit for working capital found interest rates prohibitive. To make them bearable, a lasting inflation process was needed, so that costs could be transferred by companies to their products. Until the monetary reform in 1993, businesses attempted to regulate their prices by using the highest price index, which would make it possible to eliminate most of the financing cost of capital obtained. The stabilization policy curtailed this practice after 1993. With high interest rates and only short-term credit available, there were few financing alternatives for either investments or working capital. The practical effect of the economic policy between 1990 and 1994 was to insure business losses, as has been confirmed in specialized business publications. The profit rate for the 1,000 largest corporations, for example, was negative between 1990 and 1992 (Table 2). A data sample of 596 firms (large, medium, and small), provided by SERASA, shows similar results: losses between 1991 and 1993.

Table 2. Profit Rate (%) 1,000 Largest Corporations

	Private National	Multi-Nacional	State Firms	Total
1989	9.03	17.92	3.76	6.54
1990	-2.56	-9.14	-7.28	-5.55
1991	-2.66	-5.48	-1.80	-2.21
1992	-0.99	2.52	-1.17	-0.95
1993	.96	4.08	-0.04	.40
1994	9.80		1.39	5.05

Fundação Getúlio Vargas, *Conjuntura Econômica*, December , 1994/95.

According to the periodical *Conjuntura Econômica*, which published Brazilian global indicators and analyses, for the period between 1990 and 1994, the main source of funds to finance investment consisted of profits. (Table 3)

Classically, internal finance in the form of retained earnings and depreciation is important in business financing practice. But the losses sustained during the cited period reduced internal finance to the depreciation and, therefore, the registered losses significantly affected overall investment capacity of these 596 firms.

The 90s were marked solely by administrative restructuring shocks. The imposition of certificates such as ISO (International Organization Standardization) forced firms to concentrate on investment in quality and efficiency, thus hindering new initiatives. As a consequence, economic productivity increased significantly from the 90s on. It is, therefore, important to discuss financing in the Brazilian economy, since external competition combined with recession had reduced the capital generation capacity of businesses.

Table 3. Sources and Uses of Funds (% of total)

Sources	CF	SE	LO	FL	NG	OT
1989	58	3	18	2	1	18
1990	58	3.5	24	4,5	1,4	9
1991	55	5.4	27	3.4	1.8	7
1992	46	3.1	24	7.7	2.5	16
1993	58	2.2	21	2	3.4	13
1994	31	2.1	11	3.5	1.5	51
Uses	VE	NE	FE	NB	EX	OT
1990	4.6	46	12	7.1	22	9.1
1991	6.1	40	17	5.8	21	9.7
1992	4.7	44	14	4.1	21	13
1993	4	35	21	3.6	22	13
1994	5.8	25	6.7	1.9	10	50

Conjuntura Econômica, 1989-1994. Sources: CF= cash flow; NE = stock emissions; LO = loans; FL = foreign loans; NI = not given; OT = others. Uses: VE = vehicles; NE = national equipment acquisition; FE = foreign equipment acquisition; NB = new firms; EX = expansion; OT = others.

In Brazil, the financing system is not organized to offer long-term credit, which is only available through the BNDES system. In macroeconomic terms, financing through capital markets is insignificant. Therefore self-financing has, for decades, been independent of State agencies and of vital importance as a source of funds for firms. Within this context the negative profit rate for the period 1991-1993, as shown by the SERASA sample, eliminated retained profits, a major financing option. According to the data, the alternatives remaining were, long-term loans, new emissions, and sales of assets.

In addition, the credit and capital markets are of little relevance to Brazilian businesses seeking long-term external funds for the financing of firms. This may constitute either a strong indication of the existence of credit rationing in the Brazilian economy, or firms' reluctance to finance themselves in any case.

Bresser Pereira (1993) showed that in the 70s, the difference represented by the cushion between interest and profit rates stimulated the decision to invest. In the

90s the inverted cushion, i.e., a very large difference between declining profit and increased interest rates, discouraged investments in fixed assets.

Table 4. Securities Returns and Loan Costs (% Real Yearly)

1 Year	2 Inflation	3 Money Market Rate	4 Certificates of Deposits	5 Lending Rate (WorkingCapital)	6 Bill Discount
90	1794.8	-21.6	14.1	106.4	323.9
91	478.1	19.1	30.4	80.1	85.0
92	1149.1	33.8	33.6	85.9	94.3
93	2489.1	23.0	18.6	60.5	56.9
94	948.8	20.6	13.4	42.9	378.2

Banco Central do Brazil

Table 4 shows yearly inflation and actual financing costs. Columns 3 and 4 show the yearly yield percentage derived from government (column 3) and private (column 4) securities. Columns 5 and 6 show the loan costs for working capital and bill discounting which were transferred to product prices, creating a relentless inflation cycle. At that time, banking system offered a money market rate to resident customers on checking accounts (interest on cash deposits).

Bresser Pereira showed that in critical times, such as the beginning of the 90s, in general interest rates generally played a major role in entrepreneurial investment decisions. This was not only because of the high interest rates themselves but also the interest yielded by short-term federal securities investments. Firms needing liquidity for investment purposes paid high interest rates. Others with liquidity received interest on securities (paid daily by banks).

Because of the recession and frequent business losses in this period, the question arises as to the sources used to finance investment. In a face of the competitive pressure and in spite of the high interest rates firms may have used working capital to continue fixed asset investment.

The exploration of this contradictory evidence in the Brazilian financing model first requires examination of the organization of empirical investment models.

II. The Empirical Investment Models

Historically, empirical models of business investment, such as the accelerator,

neoclassical, and liquidity, have been tested using accounting information of individual firms. Authors representing different schools of thought, such as Meyer & Kuh (1957), Hall & Jorgenson (1967), Jorgenson & Siebert (1968), Jorgenson (1971), and Elliot (1973), among others, have investigated the determinants of investment relying on the assumption of a representative firm. They tested their hypothesis using a single sample including several firms.

The neoclassical model considers external funds as perfect substitutes for the firms' internal capital. Accepting the Modigliani & Miller (1958 and 1961) theorem implies that investment spending can be explained through real variables, such as prices and technology, and treats with absolute independence the relations between investment decisions and a firm's financial condition. With this formulation, Jorgenson proved that the coefficient of the sales variable is dominant and significantly different from zero. Firms choose how much to produce according to the notion of perfect competition. Their sales expectations have, therefore, an important impact on investment spending. In econometrical terms, this variable prevails over others eligible for inclusion in the equation, in which case it underlies the model proposed by Clark (1917) cited in Chirinko (1993).

According to Fazzari, Hubbard & Petersen (1988) models derived from accelerator, as well as those from neoclassical theory, have been used with excellent results, but the strong accelerator effects have impeded a more realistic evaluation of the model itself. In the neoclassical version, capital costs affect investment only through those variables which include sales. With the expectation of higher sales volume, a firm adjusts its capital stock whenever the investment return rate is at least the same as the capital cost, represented by the interest rate.

However, the econometrical result yielded by the neoclassical model was biased since it was based on the selection of large firms whose behavior was only representative of a privileged part of the business population, allowing neoclassical authors to affirm that firms behave according to the MM theorem.

Although Elliot (1973) had contradicted the neoclassical results, reviving the arguments made by Meyer & Kuh (1957) that a firms' liquidity affected its investment spending, the representative firm concept still prevailed, continuing to hide financing differences among individual firms.

The point in common between the neoclassical and the other approaches in the 60s and 70s was acceptance of the representative firm concept. Any econometric

model including this concept ignores individual business financing characteristics.

A recent investment theory has asserted that the neoclassical model, in the form of a modern accelerator version, hid a fatal relation to the neoclassical theory as a result of its acceptance of the representative firm concept. By supposing that sales increase werer due to a profit maximization policy and thus stimulated a firm to adjust its capital stock, it hid another relation, i.e.,

> strong accelerator effects have clouded the empirical evaluation of the neoclassical model because many versions of the neoclassical approach allow the cost of capital to affect investment only through variables that also include sales or output (Fazzari, 1993, p. 18).

The sales impact may, in this way, have been underestimated, while the capital cost impact may have been overestimated. The first implication is that not separating these effects may give the neoclassical approach more credit than it deserves, and the second is that the absence of the distinction in the implementation of economic policy can cause great problems for the economic agents. In terms of analysis, besides the benefit of separating elements such as capital cost and sales, other variables resulting from studies ruled out by neoclassical criteria, are now being tested by an asymmetrical information hypothesis and could contribute to the understanding of investment behavior.

Under a different system of analysis, firms in different financial conditions would also be differently qualified for obtaining credit, either in the credit market, as shown by Stiglitz & Weiss (1981) and Stiglitz (1992), or in the capital market (Myers & Majluf, 1984). A break would be necessary with the representative firm concept, and another concept postulated such as the finance hierarchy (Fazzari *et al*. 1988).

The latter would be justified if the presence of asymmetric information was verified. Leave it in the neoclassical investment equation, modified by introducing the liquidity variables, could reveal very different susceptibilities of groups of firms to their financial conditions.

Fazzari *et al*. (1988) proved, by using several versions of the accelerator model, the relevance of liquidity variables (profits + depreciation), mainly for certain firm classes inside the whole sample such as those that, according to the authors' hypothesis, would be more susceptible to credit rationing because of asymmetry, i.e., firms with low dividend distribution levels. This class would make evident to the market the need to retain dividends for self-financing due to the constraints faced in the capital market.

When trying to answer questions raised by their own work (1988), specially the claim that cash flow may simply proxy shifts in investment demand, Fazzari & Petersen (1993) tested the hypothesis of working capital when used as a source of funds for investment financing. Although the Q model had this function, there are many critics of its reliability. Thus, as we shall see, the introduction of working capital would perform a strategic function.

In fact, working capital is widely known for maintaining short-term productive activities, while being extremely susceptible to cash flow fluctuations (profit + depreciation) and sales. A business administers this capital according to liquidity needs, mainly operating needs, demand fluctuations, and unforeseen expenses. The reversibility of working capital, as compared to fixed capital investment, facilitates trade-offs because it allows contraction enabling firms to finance fixed investment spending. Any firm's profitability will generally determine the expansion rate of this resource and its strength in times of economic crisis. To begin with, working capital profitability is inversely related to its stock, because a high stock of working capital reduces asset profitability as fixed capital would not.

If the working capital investment parameter were negative and statistically significant, then Fazzari & Petersen (1993) could clarify two points: 1. cash flow does not function as an investment demand proxy; 2. working capital competes with fixed investment. Firms with low distribution levels are shown to be much more dependent on working capital than those with high levels of dividend distribution.

Changes in working capital are positively related to profits, product, and economic cycles. Hence, if working capital functions as a proxy for investment demand, its coefficient should be positive and, therefore, reduce the cash flow coefficient when included in the investment equation. But the working capital coefficient has a negative sign in the study by Fazzari & Petersen (1993) and when included in the investment equation had no effect on cash flow coefficient.

Other studies such as those of Hoshi, Kashyap & Scharfstein (1991), Schaller (1993), Hu & Schiantarelli (1994), and Hubbard, Kasyap, & Whited (1995), among others, tested the importance of firms' financial conditions in investment spending.

The model proposed by Fazzari & Petersen (1993) has, however, been little explored. We believe that in the Brazilian case this version is better suited for showing the credit rationing level faced by firms because of the lack of long-term financing sources and mechanisms, stemming from both the financing pattern and

high inflation. Thus, the greater the working capital investment, the greater the firms' financing need.

III. Financing in Brazil

Among the few econometric approaches to investment financing in Brazil in recent decades, that of Filardo (1986) investigated the investment demand function based on a sample of 314 firms, for 1970-1977, taken from CADEC (Taxpayers' Special File). These same firms were studied throughout the 8-year period and represented various industrial sectors.

Filardo examined a concept of Eisner (1978), which holds that investment is a function of two independent variables, sales and profitability and their lags. The basic relation proposed was investment as a function of sales and profit rates, which were estimated according to various aggregation levels through regression. The most meaningful results were: the showed 0.542 for sales growth rate and 0.0042 for its lag; -0.842 for the profits and 0.939 for its lags; and the R^2 was 0.46 and the F test gave 65.921. With the exception of the sales growth rate lag over the period, all results were significant to 1% .

The variable, sales growth rate for the periods t and t_{-1}, was meaningful and positively related to the investment (6). For Filardo,

> current and past sales growth rates are firm indicators of the market and provide information about future product demand. This is why sales growth rate is positively related to investment. (Filardo, 1986, p. 71)

About the profits in t and t_1,

> It is possible to conclude that ... because the profit rate in t_{-1} has a positive sign, and in t a negative sign, neither variable is introduced as an expected future profit proxy, because of a sign inversion. (Filardo, 1986, p.71)

Since the 70s studies of other kinds such as investigations carried out by *Conjuntura Econômica*, have systematically shown the predominance of productive investment self-financing in a group of large Brazilian firms. Financial studies, of the type done by Zonneschain (1998), demonstrated that in a sample of 216 stock companies selected according to the number of stocks negotiated in the stock and bond market from 1989 to 1996, self-financing was decisive in 5 out of the 8 years studied. The number of firms in the sample varied, implying that the author did not prioritize following the same group throughout. Those sampled maintained a very

close relation to capital market investors and their strategic decisions influenced their stock prices and their financing capacity through share issues.

Despite the degree of market interaction and information flow, the main financing source was not issued share. The question then arises as to how Brazilian firms finance themselves, specially in the wake of large-scale losses such as those which occurred between 1990 and 1994.

To evaluate the susceptibility of investment to financial variables for a sample of 596 Brazilian firms, we will test a model, proposed by Fazzari & Petersen (1993). This will make it possible to determine whether profits were as important for investment in the beginning of the 90s as they were in the study by Filardo (1986). At the same time, we believe that introducing working capital investment will reveal more about firms' financing behavior in Brazil.

IV. The Model

Of the 600 largest stock companies kept track of by SERASA only 155 were registered every year from 1989 to 1994. Information was also collected by SERASA on a total of 441 small and medium firms. The criterion used by SERASA for classification according to size is the total asset value expressed in "*ufir*". The firms which form the sample are classified as large firms (155) and small and average firms (441), totalling 596 representing the industrial, commercial, and service sectors. By means of a sample of varied types of firms we want to avoid restricting our sample, as did Fazzari, Hubbard, and Petersen (1988). Rather, we decided to maintain in the sample firms from all sectors except agriculture.

To match the low vs. high dividend distribution of the Fazzari & Peteresen (1993) scheme, we separated the firms in our sample into two groups: large firms (LFs) and small and medium firms (SMFs). However, testing the susceptibility to liquidity constraints of different classes could not be done by dividing firms following the Fazzari and Petersen criterion. This is because capital markets in Brazil are poorly developed and business ownership is very concentrated. The dividend policy of firms is, therefore, much more endogenous than that found in developed capital markets and is managed to suit the owners, who also retain almost the totality of shares. For this reason our classification scheme is based on small and medium firms (SMFs) and large (LFs).

A look at Brazilian industrial history shows that many large private and state

firms responsible for capital formation from 1930 to 1980 are listed on the stock market. These business built long-term relationships with capital market investors, just as SMF are trying to do with the banking system. The stock companies, for example, are mature firms with concentrated ownership and great collateral asset availability, the common features of large firms in our sample.

The SMFs are not listed in the capital market. Their financial information is not published by the stock market but by the banking system regulator. Their reputations and collateral assets represent constraints on SMFs in obtaining credit and who, in an effort to mitigate this problem, labor at building a sound reputation in the banking system. By releasing their financial information to SERASA on line, which in turn markets it to the banking system, the SMF become targets for the banking business. In addition, this spontaneous and steady offer of financial information to SERASA increases their trustworthiness in the eyes of the banking system, on which both the LFs and SMFs depend almost exclusively credit.

We expect the working capital investment parameter to have a negative sign in the tests and the working capital investment itself to be more important for small and medium firms (SMFs) than for large firms (LFs). However, we also expect to find the working capital investment parameter of LFs to be very significant in the equation. Our hypothesis derives from two circumstances: firms in Brazil, with their information released in the capital market and banking system have not overcome the difficulties inherent in developing capital markets. This indicates that credit rationing prevails in Brazil and is not exclusive to certain groups of firms.

To the general form of the reduced-form investment equation we examine below, we assign X as a vector of variables, possibly including lagged values. X_{jt} represents the observation of the variable for firm j in the period t. The data are annual. The number of observations of each X variable a year will be 596 and the total number of observations of each X between 1990 and 1994 will be 2,980. All variables are scaled by the firm`s beginning-of-period capital stock K_t to control for heteroskedasticity.

In order to use the investment demand model proposed by Fazzari & Petersen (1993) we must identify the variables that determine the working capital investment. Model I identified these variables: $(VCG / K)_{jt} = (CF / K)_{jt} + (S / K)_{jt} + (CG / K)_{jt}$,

(I)

where: (VCG)$_{jt}$ = working capital investment; (CF)$_{jt}$= cash-flow (profits + depreciation); (S/K)$_{jt}$ = sales in the period; (CG)$_{jt}$ = working capital; and (K)$_{jt}$ = capital stock at the beginning of the period. In model (IA) we did not included the variable (CG).

The total investment (I)$_t$, in fixed assets and working capital, forms the model (IB): $(I/K)_{jt} = (CF/K)_{jt} + (VCG/K)_{jt}$.

(IB)

The coefficient estimates for equations (I, IA, and IB) are reported in table 5.

Following the methodology of Fazzari & Petersen (1993), we will use the 2-stage least square method. With the 2-stage least square method, we include the working capital investment, obtaining model II:

$$(CAP/K)_{jt} = (S/K)_{jt} + (S/K)_{jt-1} + (CF/K)_{jt} + (C/K)_{jt-1} + (VCG/K)_{jt} + \gamma + e,$$

(II)

where: (CAP/K)$_{jt}$ = fixed Investment in the period; (S/K)$_{jt}$ = sales in the period; (S/K)$_{jt-1}$, = sales lag; (CF)$_{jt}$ = cash-flow; (CF)$_{jt-1}$ = cash-flow lag; γ = dummy variables; e = error; and (K)$_{jt}$ = capital stock at the beginning of the period. In estimating equation (II), we must account for the endogeneity of changes in working capital, because it is a decision variable for the firm. For this reason, we estimate this equation with instrumental variables. The instruments are beginning-of-period cash flow, beginning-of-period stock of working capital divided by the fixed capital (W/K)$_t$, sales, sales lag, and fixed time.

In model II we use the investment data based on the source and use of funds, i.e., investment flow. By assuming a similar behavior among all firms, we disregard the estimation intercept. Finally, we standardized the variable averages, in order to force the average to zero for all of them.

In model II we do not estimate the Tobin's q as Fazzari and Petersen (1993) did. The reasons for that are various. First, the SMFs are not listed in capital markets, making impossible to apply a model with Tobins's q for the whole sample. Second, stock prices during high inflation induce great estimation problems and Brazilian inflation in the beginning of the 90s was extremely high, as Table 4 shows. Third, the market at that time was biased since a preponderance of State-owned companies blue-chip shares had had their prices affected by government interference in their financial management. Fourth, in the 1990s, enforced application of the official price index

undervalued balance sheets, which reduced profits and dividend payments. Fifth, Brazilian stock markets are not used by businesses for raising funds; instead, they provide speculation opportunities, particularly for making short-term profits.

V. Results and Final Observations

In terms of behavior, we verified that the SMFs systematically distributed dividends. Large firms, in general, did not. When they did, however, they increased their losses. Considering the total set of samples, 43% registered losses; among the SMFs, the percentage of losses among the samples reached 44.7% and among the LFs, 50%. Working capital investment was negative in over 46% of the total set of samples. 45.6% for the SMFs sample and 50.2% for the LFs sample. According to the hypothesis that the working capital investment is used to finance fixed investment, the within-firm variance of the fixed- investment-to-capital ratio must be less than the cash flow variance, which in turn should be less than the variance of working-capital investment. Empirically, we observe that the within-firm variance of the fixed-investment-to-capital ratio (1.089) is 78.4% less than the cash-flow variance (5.06), which for its part is 4.2% less than the working-capital investment (5.28) for the SMFs. For the LFs, the within-firm variance of the fixed-investment-to-capital ratio (0.37) is 15.9% less than the cash-flow variance (0.44), which consequently is 24.1% less than the working-capital investment (0.58). For all the firms, the within-firm variance of the fixed investment-to-capital ratio (0.94) is 78% less than the variance of cash flow (4.29), which is 4% less than the working-capital investment (4.47).

The high variability of the working capital investment with respect to the other variables proves that when liquidity for investment lacks, firms decide to reduce working capital stock to create it.

Thus, the reversibility of working capital compensates for lack of long-term resources as financing sources. Due to the high inflation of that time, firms kept a large amount of working capital as money which yielded daily interest rates in checking accounting. In other cases, speculation occurred not with securities, but with the inventories. Due to the possibility of need for investment, the firms in our sample contracted current assets and/or increased current liabilities, creating the liquidity necessary to acquire fixed assets. In spite of the high cost of short-term financing sources, it was possible to transfer costs to the prices, thus closing the financing cycle.

Before testing the working capital investment in the investment-demand

equation, it is necessary to identify working capital determinants. Model I, evaluated below, shows that cash flow is statistically significant and the main determinant of working capital investment. When a firm generates profit, the working capital investment increases. Working capital stock is not negatively related to its variation, because the available monetary resources received interest from the banks and, due to inflation, firms in Brazil profited from speculation with inventories.

As we saw, Model I is highly adequate and according to the value of R^2, explains 85% of the firms' behavior. By adding the fixed assets and working capital investments, we produced Model IB, from Table 5 which, is explained according to R^2.

Table 5. Estimated investment function in working capital and total investment

Independent Variables	Model I	Model IA	Model IB
	Dependent variable: change in working capital	Dependent Variable: change in working capital	Dependent variable: total investment (in fixed assets and change in working capital)
S_t/K_t	-0.006675 (-8.417)	-0.002521 (-3.171)	0.000513 (0.475)
CF_t/K_t	0.875063 (88.440)	0.970641 (113..352)	1.056846 (25.264)
CG_t/K_t	0.098740 (16.908)		
R^2	0.8539	0.8375	0.4568
F	2484.831	2630.208	193.881
N.OBSERVATION	2550	2550	1376

t Statistics within parenthesis

We examined the high sensitivity of total investment to cash flow and the working capital investment (Model IB). The cash-flow was crucial, because the higher its magnitude, the higher the nonoperating income due to high money market rate offered by banking on checking accounts, and the lower the necessity to reduce working capital for new investments. Thus, businesses faced the following dilemma: to invest in fixed assets when profit reductions result from greater competition created by trade liberalization; or to increase nonoperating income simply by banking available monetary resources at high interest rates.

Once the relations between working capital, cash-flow, and working capital investment are known, we will estimate the fixed investment demand equation.

In Table 6, we show the results of Model II for all firms sampled, in accordance with the version developed by Fazzari & Petersen (1993). We verified that with this model the sales variable has very low parameters. Elimination of this variable did not affect the value of the CF and VCG parameters. The cash flow (0.69) and the working capital investment

(-0.55) are statistically significant and explain investment demand. As expected, the sign of the working capital investment is negative, showing that the decision to invest in working capital competes with the decision to invest in fixed assets. This demonstrates the difficulty of using other financial tools for raising funds. Stock emissions e.g., were not a financing alternative for large firms due to investor demand for high returns. Commercial banks lacked the incentive and, consequently, the technology to monitor large numbers of loans. Instead, they lent large sums to few clients.

A glance at the SMFs and LFs groups confirms the statistical significance of working-capital investments in both samples, which as anticipated is more important for the SMF group. For this sample, the working capital investment parameter was (-0.54) and the cash flow parameter was (0.70). Although the sales coefficient is significant, at 1%, the parameter value is nearly insignificant.

For the large firms, we found only the working capital investment (-0.36) and sales (0.04) parameters to be statistically relevant. Although the working capital investment parameter (VCG) was lower for the LFs group than for the SMFs group, we confirmed the relevance of the working capital investment, for the whole sample, as shown in Table 6.

Sales increases did not improve the financial situation of the firms in our sample, because more working capital was necessary to finance short-term production. But operating income was greater before sales increase. The best strategy, therefore, was to modernize fixed equipment and keep sales constant.

The neoclassical theory states that the effect of profits on investment must be interpreted as a proxy for factors which alter investment demand, and not as evidence of finance constraint. If this were true, then the working capital investment, which is positively related to sales and profits, should have a positive sign in the Model II investment demand equation, which it did not. The R^2 value, which may appear, is influenced by sample heterogeneity, and when the 2-stage method is applied, there is no consensus about its importance.

The plus sign of the cash flow coefficient and the minus sign of the working capital investment coefficient prove that the profits do not represent the expected profitability. The working capital coefficient does not lose statistic significance when the sales variable is in the model.

Table 6. Estimation of the investment function 2 stages

Independent variables	Model II with sales	Model IIA without sales
S_t/K_t	-0.028328*** (-5.990)	
S_{t-1}/K_t	0.041913*** (6.521)	
CF_t/K_t	0.695512*** (8.047)	0.705115*** (8.329)
CF_{t-1}/K	0.171370*** (2.797)	0.268314*** (4.636)
VCG_t/K_t	-0.552114*** (-8.599)	-0.626835*** (9.614)
R^2	0.1175	0.0857
F	18.086	17.189
N.OBSERVATION	1027	1036

t statistics within parenthesis

Because of the importance of the working capital investment on one hand and profits on the other, we observe very strong credit constraints in Brazil, which underlie the incapacity of the economy to expand employment and income. More than long-term sources, the factors which feed liquidity, mainly that of the small and average businesses, are the same which allow investment expansion. The results indicate the degree to which credit rationing in Brazil affects investment capacity.

Fazzari & Petersen (1993) model allowed us to examine deeply corporate finance in Brazil. In particular, we examined firms' option to convert substancial monetary funds – working capital investment – into fixed assets. This choice represented a loss because the greater the working capital, the higher the nonoperating income (this can be seen by the positive correlation between working capital stock and its variation in Table 5 – Model I). Therefore, for a firm to reduce this capital and relinquish a risk-free investment, strong pressure must exist such as that arising from the trade liberalization of the Brazilian market, which made firms consider fixed investments more seriously. Thus, trade liberalization affected not only the income of Brazilian firms but also their working capital stock. Entrepreneurs were suddenly forced to stop equating the marginal benefits of investment in securities or in fixed assets. In sum, the interest rates reduced the effect of sales on fixed investment and increased the effects of internal finance on fixed investment but only when working capital was inclued in the investment demand equation as Fazzari & Petersen (1993) did.

The evidence for the importance of using working capital investment to large firms which have their information published in the capital market in contrast to the small and medium ones which have their information published by the banking system – does not indicate that only the SMFs suffered from the rationing effects. The

strong degree of liquidity constraint in both LFs and SMFs group is, first, due to institutional and historical factors in the financing profile of the Brazilian economy, and then to high interest rates, as pointed out by Bresser Pereira. This conclusion was reached after applying the model developed by Fazzari & Petersen (1993), which emphasizes the influence of working capital investment over fixed asset investment. As working capital is directly influenced by the interest rate, it was possible to show that firms evaluate how much to invest in fixed assets in accordance with nonoperating income by simply leaving working capital in the open market**.**

Working capital investment to finance fixed assets sets the Brazilian economy on a structurally fragile path. Since working capital investment competes with fixed asset investment, using the former reduces a company's solvency guarantee during the investment process. In periods of recession, there is a natural reduction of working capital. Therefore, business investments must be either reduced or ended. In this case, however, it is difficult to strike the right balance which in any event will cause at least a slowdown and, in the worst case, paralyzation. Unlike what is seen in international practice, the same working capital investment used to finance fixed investment in Brazil, also finances short-term fluctuations. The negative effects of an exogenous shock (such as a financial crisis) or of a tight economic policy are intensified, producing a greater impact than otherwise would be expected on employment and income because of the susceptibility of investment to firms' financial conditions.

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