

DOES MONETARY POLICY AFFECT A FIRM'S INVESTMENT THROUGH LEVERAGE? MICRO EVIDENCE FOR INDIA

1. INTRODUCTION

It has been argued that changes in monetary policy have large impact on real economic variables (Bernanke and Blinder, 1992). The channels through which these effects are transmitted are, however, still a matter of debate. Several channels of transmission have been proposed in the literature. Salient among these include the money channel and the bank lending channel. Via the former channel a reduction in bank reserves lowers the stock of money, which leads interest rates to rise. Investment and aggregate demand, as a result declines due to the higher cost of capital. Monetary contraction stemming from a lowering of reserves through the bank lending channel, on the other hand, drains deposits from the banking system and hence, reduces the supply of loans and aggregate spending (Kashyap *et al.*, 1993).

Empirical evidence as to supporting the existence of these channels is, at best, mixed. In view of this, several studies have started to explore the possible role played by capital market imperfections in transmitting and amplifying monetary policy shocks and a literature on the broad credit channel has emerged (Hubbard, 1995; Bernanke *et al.*, 1996). According to this view, because of informational asymmetries, lenders are not well informed about the quality of the firm and demand a premium on its debt or stock issued. As the premium on external finance is inversely related to the borrowers' financial conditions, such as net worth, an adverse monetary shock which causes the borrower's financial condition to deteriorate will engender an increase in its cost of external finance and a decrease in its borrowing abilities. Consequently, the borrower's investment and output will fall.

The paper employs a sample of Indian manufacturing firms for the period 1995-2004 to test whether the effects of the change in liquidity conditions on firm investment can be transmitted through

leverage. This idea can be traced back to Fisher (1933) in explaining the Depression of the 1930s. According to the Fisherian hypothesis, an unanticipated fall in the price level leads to a decline in borrowers' net worth and an increase in their real debt burdens, which results in a decrease in borrowing and investment.

More recent work on capital market imperfections has shed further light on the role of debt in transmitting monetary shocks that affects market liquidity. More specifically, because of conflicts of interests and informational asymmetries between lenders and borrowers, debt induces agency problems, which in turn lead to a premium on external funds. Since a highly indebted borrower is more likely to default and has a greater incentive to opt for excessively risky projects, the premium on external finance will be higher for firms with lower net worth or higher leverage. Bernanke and Gertler (1989) show that exogenous shocks, such as decline in production, will lower a firm's cash flow and boost effective cost of investment. The fall in investment spending will lower the firm's output and cash flow in subsequent periods, leading to the propagation of the initial shock through credit cycles (Kiyotaki and Moore, 1998).

While there is by now a rapidly expanding literature on the presence of finance constraints on investment decisions of firms in developed countries, limited empirical research has been forthcoming in the context of developing countries for two main reasons. First, until recently, the corporate sector in emerging markets encountered several constraints in accessing equity and debt markets. As a consequence, any research on the interface between capital structure of firms and finance constraint was possibly to a large extent constraint-driven and hence, less illuminating. Second, several emerging economies, even until the late 1980s, suffered from 'financial repression', with negative real rates of interest as well as high levels of statutory pre-emption. This possibly implied restricted play of market forces for resource allocation.

Issues regarding the interaction between financing constraint and corporate finance have, however, gained prominence in recent years, especially in the context of the fast changing institutional framework in these countries. Several emerging economies have introduced market-oriented reforms in the financial sector. More importantly, the institutional set-up within which corporate houses operated in the regulated era has undergone substantial transformation since the 1990s. The move towards market-driven allocation of resources, coupled with the widening and deepening of financial markets, have

provided greater scope for corporate houses to determine their capital structure.

The rest of the paper is organised as follows. Section II discusses the institutional backdrop to the present study. Section III explains the methodology and the data employed in the paper. Section IV presents the results and discusses robustness check followed by the concluding remarks in the final section.

2. THE INSTITUTIONAL CONTEXT

The introduction of the concept of a socialist economy in the 1960s with its concomitant focus on poverty reduction, egalitarianism and social equality meant that the Indian government followed highly restrictive policies with respect to trade, industry and finance. The process of transition towards self-reliance (read 'import substitution'), driven to an overarching extent by concerns of 'export pessimism' amongst developing nations nested on the logic of heavy-industry oriented industrialization within a closed economy framework. Such a policy engendered the need for industrial licensing whereby firms would have to apply for a license for setting up new units or for capacity expansion. This was coupled with a controlled regime of import restrictions that governed the utilization of scarce resources. The protection provided to domestic industry by the import licensing was buttressed by extremely high tariff levels across the board, thereby negating the free play of market forces in investment decisions. Furthermore, the licensing regime led to several adverse consequences, in the form of barriers to entry in several industries and more importantly, led to rent-seeking behavior by business houses by strategically pre-empting competition.

Not surprisingly therefore, until 1991, the corporate sector faced several constraints on its choices regarding sources of funds. Access to the equity market was controlled by a regulatory body, the Controller of Capital Issues (CCI), an agency under the Government, which imposed restrictions on corporates intending to raise funds through the equity route. Long-term debt was largely under the purview of state-owned development banks, which, either through direct lending or through refinancing arrangements, virtually monopolized the supply of debt finance to the corporate sector.

In the financial sector likewise, till the initiation of reforms in 1992, financial institutions faced heavy restrictions on application of funds. In July 1991, for instance, commercial banks had to hold

in cash reserves and Government debt instruments, as much as 63.5% of increases in deposits. In addition, they had to extend 40% of their credit to priority sectors such as agriculture, small-scale industries and housing with sub-targets for each at subsidized rates differentiated by purpose, size of loan and borrower. Even the free portion of banks' resources was subject to 'credit norms', which set inflexible limits to loans according to sector, purpose and security. The Government also regulated the use of financial instruments as well as interest rates on loans and deposits; lending rates were fixed for both priority and non-priority sectors.

In 1992, as part of the sweeping set of reforms relating to the equity market, the CCI was abolished and corporate houses were provided the freedom to access capital markets and price their securities, subject to prudential regulations of the Securities and Exchange Board of India (SEBI), the regulator of stock markets. Furthermore, Indian firms in sound financial condition were allowed to issue equity and convertible bonds abroad. Likewise, as regards raising resources domestically through debt capital, institutional reforms have been aimed at curtailing the monopoly in supply of long-term funds by development banks, with banks being also permitted to enter long-term financing.

In the financial sector, the administered interest rate structure of banks was progressively rationalised since the 1990s. The prescriptions of rates on all term deposits, including conditions of premature withdrawal and offering uniform rate, irrespective of the size of deposits, was dispensed with. Likewise, lending rates were also deregulated. The Bank Rate (the rate at which the central bank refinances commercial banks), after being dormant for several decades, was activated as a signalling rate in 1997 and simultaneously, the statutory pre-emption on bank deposits were gradually lowered, providing banks with greater freedom in credit allocation. The removal of these twin restrictions meant a greater role of the price mechanism (interest rate) in the resource allocation process and allowing corporates to freely raise resources from domestic capital markets, enabling a greater role of the market forces in company affairs.

Notwithstanding these developments, it is widely perceived that the constraints on finance have tended to persist, with the result that investment by corporates has not been forthcoming to the desired extent. Evidence indicates that, over the sample period, gross fixed capital formation by the corporate sector has declined from an average

of 7.8% for the first five years to less than 6% over the period 2000-04. Observers have therefore argued that the institutional context, in general and the export orientation of firms in particular might be an important factor towards exploring the relevance of finance constraints (Ganesh Kumar *et al.*, 2001). An important aspect not adequately accounted for in earlier studies has been whether and as to how firm leverage impacts finance constraints and this becomes a major concern of this paper.

3. METHODOLOGY AND DATA

Numerous studies have found that cash flow and other financial variables have explanatory power for investment and that the sensitivity of investment to cash flows varies with the firm's age, size, dividend policy and other variables characterizing its financial condition (Fazzari *et al.*, 1988). This suggests that, given capital market imperfections, high premium on debt and equity cause external and internal funds to be imperfectly substitutable. We test whether changes in liquidity situation can affect investment through leverage by including leverage and the interaction of leverage with an indicator of liquidity tightness together with the other controlling variables and by examining the coefficient on the interaction term.

Accordingly, the baseline equation to be estimated is given by specification (1)

$$I_{it} / K_{it-1} = \alpha + \beta_1 (CF / K)_{it-1} + \beta_2 (S / K)_{it-1} + \beta_3 LEV_{it-1} + \beta_4 LEV_{it-1} * LQD_{t-1} + YD_t + ID_t + u_{it} \quad (1)$$

where *i* (cross-section) is the firm indicator and *t* (time series) is the year indicator). Among the regressors, we have included the beginning of period ratios of cash flows to capital stock (CF/K) and sales to capital stock (S/K), beginning of period market leverage (LEV) and an interaction term between LEV and an indicator of liquidity tightness (LQD). The coefficient α represents unobserved firm-specific effects, which is assumed to be constant over time and *u* is the stochastic error term.

The lagged value of the firms' financial variables has been employed since several studies have uncovered lagged effects of monetary policy on firms' activities (Romer and Romer, 1990). Using

lagged values also enables to address the endogeneity problem¹. Year dummies (YD) are included in all models to control for common trends or business cycle effects. Finally, industry dummies (ID) are included to control for industry-specific features not explicitly factored into the analysis. Summary statistics of the variables along with their definitions is set out in Table 1.

TABLE 1 - *Summary Statistics of Sample Variables*

Variable	Definition	Mean	Median	Minimum	Maximum
(I/K)	$[K_{t+1} + \text{Depreciation}_t - K_t(1 + \pi_t)] / [\text{Plant, property equipment at end of } t-1 \text{ minus capital expenses during period } t-1 \text{ plus accumulated depreciation and amortization until the end of period } t-1 (K_t)]$. π is the average inflation rate over the sample period	0.632	0.103	-55.54	1073.80
(CF/K)	(net profit+depreciation)/K	33.587	0.091	-12.79	85.164
(S/K)	Sales/K	13.762	1.198	-7.815	85.26
<i>Leverage 1</i>	Total debt/Total asset	0.411	0.814	0	11.755
<i>Leverage 2</i>	Total debt/Total equity	7.056	5.041	0	47.610

Three aspects need to be discussed before proceeding with the empirical analysis. The first is the measurement of leverage. In line with the literature (Davis and Stone; 2004, Ghosh and Sensarma, 2004), we employ two measures of leverage: total debt to total assets (*Leverage1*) and secondly, the widely employed measure of leverage (*Leverage2*): the debt-equity ratio (Jaeger, 2003; Davis and Stone, 2004).

The second is the measure of tightness of market liquidity conditions. Several measures of the monetary policy indicator have been proposed in the literature. Since there is no consensus as to which is superior, we employ two alternate indicators that have been widely employed in the Indian context. The first one is the Bank Rate, which is the medium-term signaling rate of the monetary authorities. The disadvantage of this variable is that it was essentially

¹ If the contemporaneous value of cash flows, sales and leverage are used, the estimates on the coefficients of the equation will be biased because these variables are endogenous.

static over a large span of the sample period, and therefore might be inadequately equipped to capture the tightness of market liquidity condition. An alternative indicator is the primary cut-off yield on 364-day treasury bills. Using the yield on T-bills to capture the liquidity position in financial markets has gained prominence of late, both internationally (Calvo and Reinhart, 2002) as well as in the Indian context (Prasad and Ghosh, 2005).

Third, and following from the second, we construct our (continuous) indicator of liquidity tightness by taking the difference between the yield on a representative 10-year T-bill and the short-term rate (as captured by the Bank Rate or the 364-day T-bill yield). Accordingly, we compute four measures of liquidity tightness².

The source of the data is the publicly available *Prowess* database (Release 2.4), generated and maintained by the Center for Monitoring the Indian Economy (CMIE), a leading private think-tank in India. This database is broadly similar to the *Compustat* database of US firms and is increasingly employed in the literature for firm-level analysis on Indian industry for analysis of issues like the performance of firms affiliated to diversified business groups (Khanna and Palepu, 2000), the interlinkage between monetary policy and corporate governance (Ghosh and Sensarma, 2004) and the association between banks' non-performing loans and corporate leverage (Ghosh, 2005). The dataset contains financial information on around 8,000 companies, which are either listed on the stock exchanges as well as major unlisted public limited companies having sales exceeding Rs.10 million (US \$1≈Rs.44). In addition, if an entity is not listed, it qualifies for inclusion in the database if the average sum of sales and total assets is at least Rs.200 million as per the latest audited financial results. There is detailed information on the financial performance of these companies culled out from their profit and loss accounts, balance sheets and stock price data. The database also contains background information, including equity holding pattern, product profile, plant location and new investment projects for these companies.

² These four measures are:

LQD1=lager (Leverage 1)*lager (Spread 1)

LQD2=lager (Leverage 2)*lager (Spread 1)

LQD3=lager (Leverage 1)*lager (Spread 2) and

LQD4=lager (Leverage 2)*lager (Spread 2)

where Spread 1=10 year T-bill yield less 364 day T-bill yield
and Spread 2=10 year T-bill yield less Bank Rate

The selection of the sample firms proceeds in three steps. In the first step, we select all firms that are listed on the National Stock Exchange³. This is done with a view to ensure that we consider all listed firms encompassing the period beginning 1995 through 2004. This provided us with a total of 1538 companies. In step two, given the focus on the choice of debt by manufacturing firms, we only retain firms whose main activity is in manufacturing, but exclude those for which their main activity is in the service sector, including finance. This classification left us with a total of 1210 firms in the manufacturing sector. In the last step, we delete firms for which data on the relevant dependent variables were not reported for at least five consecutive years of the sample. Following from this criterion, we were finally left with a total of 1118 manufacturing firms for the entire sample period. The composition of the sample is presented in Table 2. It can be observed from the table that around 40% of the firms belong to chemicals, machinery and textile, indicating that given the classification adopted for incorporation of firms in the database, a significant proportion belong to these three sectors.

TABLE 2 - *Distribution of Sample Firms by Industry Classification*

Industry	Number of Firms	Percent to Total Sample
Heavy	338	30
Drugs and Pharmaceuticals	87	8
Chemicals	154	14
Cement	50	4
Textile and textile products	146	13
Auto Ancillaries	77	7
Food, Sugar and Beverages	126	11
Diversified	35	3
Others	105	9
Total	1118	100

Source: Compiled from *ProWess* database

4. ESTIMATION AND RESULTS

The results of the estimation procedure are reported in table 3. For the whole sample, the estimates on the coefficients on leverage are positive and significant at the 1 percent level; the interaction

³ For listing purposes, we consider the National Stock Exchange (NSE), the state-of-the-art exchange for listed companies in India. The NSE commenced operations in 1994, but became fully operational since 1995.

terms with *Spread 1* as the measure of monetary policy tightness is negative and significant. This suggests that while an increase in leverage raises investment, the rise is dampened if a monetary contraction follows. More specifically, the estimates imply that tightening of liquidity by one percentage point lowers investment by 0.39% (0.478×0.814) through leverage for a firm with a median leverage in the sample. Across all equations, sales have positive effects on investment. The adjusted R^2 indicates that the specification with *Spread 1* as dependent variable explains between 25-34 percent of the variation in investment. When debt equity ratio (DER) is considered as the alternate measure of investment, neither the ratio nor its interaction with monetary policy tightness indicator are significant at conventional levels, suggesting that DER does not perform well as a measure of leverage in the Indian context.

TABLE 3 - *Estimates of Investment Equation – Overall Sample*

Variable	Model 1	Model 2	Model 3	Model 4
Intercept	0.195 (0.922)	0.181 (0.919)	0.197 (0.902)	0.197 (0.902)
Lag (CF/K)	-0.021 (0.291)	-0.034 (0.291)	-0.253 (0.288)	-0.254 (0.288)
Lag (S/K)	0.005 (0.001)*	0.005 (0.001)*	0.009 (0.002)*	0.009 (0.001)*
Lag (Leverage 1)	0.910 (0.489)***	0.907 (0.432)***		
Lag (Leverage 2)			-0.009 (0.018)	-0.009 (0.018)
LQD1	-0.478 (0.289)***			
LQD2			-0.0001 (0.001)	
LQD3		-0.412 (0.205)**		
LQD4				-0.0006 (0.006)
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
<i>Diagnostics</i>				
Number of observations	7187	7187	7179	7179
Time period	1995-2004	1995-2004	1995-2004	1995-2004
Adjusted R-square	0.340	0.250	0.006	0.007

Standard errors in parentheses

*, ** and *** indicates significance at the 1, 5 and 10% level, respectively

We consider several robustness tests of the baseline model. First, we consider whether larger firms are more affected by a liquidity tightening *vis-à-vis* smaller firms. Firm size has frequently been used as an indicator of whether or not a firm is more likely to be financially constrained. For example, Carpenter *et al.* (1994) employ firm size in their work using US firm-level data, while Devereux and Schiantarelli (1990) use it in their analysis on financial effects

and fixed investment by employing data on UK firms. The basic idea is that, in general, larger firms have access to a wider range of suppliers of finance than smaller firms, and as a consequence such firms are likely to be relatively less impacted by a monetary tightening than smaller firms. Accordingly, we construct a dummy variable for size, which equals one if the size of the firm, defined as the logarithm of the firm's total assets, is smaller than the median firm size in the sample. This dummy is interacted with the liquidity tightness indicator defined by *Spread 1* (see footnote 3). The results, presented in table 4, show that this coefficient is negative and significant at conventional levels. More specifically, the results support the findings of Devereux and Schiantarelli (1994) that large firms encounter lower financing constraints.

The second aspect we consider is whether liquidity tightening has a relatively severe impact on younger firms *vis-à-vis* older firms. In their analysis of financing constraints for UK firms for 1972-86, Devereux and Schiantarelli (1990) found that old firms are relatively less finance-constrained *vis-à-vis* young ones. Accordingly, we construct a dummy for age, which equals one if the age of the firm is below the median age of firms in the sample and interact this dummy with *Spread 1*. The results indicate that the magnitude on this coefficient is negative and highly significant at conventional levels. This suggests that the effects of a contractionary market liquidity response on younger firms are much more pronounced *vis-à-vis* older firms. Stated differently, with limited recourse to alternative sources of finance, young firms are the hardest hit by a liquidity contraction. On the other hand, older firms, with greater reputation about their activities are able to access a wider range of suppliers of finance, and consequently, relatively less impacted consequent upon monetary tightening.

The third specification examines the case of firms export intensity. Ganesh Kumar *et al.* (2001) have argued that in the Indian situation, the manner in which finance constraints manifest themselves would depend on the institutional context. Specifically, they proposed 'outward orientation', as measured by the export to sales ratio, as a relevant criterion for distinguishing finance-constrained firms from those which are not. Intuitively, greater the 'outward orientation' of the firm, greater the likelihood that it can rely on external finance to augment its resource requirements. As a result, the impact of a liquidity tightening on such firms is likely to be limited *vis-à-vis* firms that are relatively less outward oriented. To test this possibility, we construct a dummy which equals one if the export-to-sales ratio

of the firm is below the median export-to-sales ratio of all firms in the sample and interact this dummy with *Spread 1*. The results, reported in Model 7, indicate that the coefficient on this interaction term is negative and significant. This is supportive of the findings of Ganesh Kumar *et al.* (2001) that the effects of a monetary tightening are less binding on such firms.

The final aspect of interest is liquidity of firm's shares: whether firms whose shares are more actively traded on the stock exchanges encounter finance constraints different from those firms whose shares are relatively less liquid. Following Fazzari *et al.* (1988), it is assumed that there are cross-sectional differences in the effects of internal funds on firms' investment, so that the investment equation should hold across adjacent periods for *a priori* constrained firms, but violated for unconstrained firms. This has led to different *a priori* classifications of firms that have tried to distinguish financially constrained and not-constrained firms. Accordingly, studies have grouped firms by dividend payout (Fazzari *et al.*, 1988); other *a priori* groupings of firms have focused on group affiliation (Hoshi *et al.*, 1991), size and age (Devereux and Schinattarelli, 1990; Carpenter *et al.*, 1994), the presence of bond ratings (Whited, 1992), the degree of shareholder concentration or the pattern of insider trading (Oliner and Rudebusch, 1992) and interest coverage (Guariglia and Schiantarelli, 1998; Milne, 1994). An aspect of firm behavior not incorporated in earlier studies is the issue of liquidity of firm scrips.

In emerging markets as India, despite the fact that there are several thousand companies listed on the stock exchange, only a handful of them are actively traded. This makes liquidity of firms' stock an important consideration for distinguishing constrained versus non-constrained firms. Earlier studies, which focused primarily on developed economies, did not take adequate cognizance of this fact.

To address this possibility, we construct a dummy which equals one if the shares of a firm were actively traded on at least 75 percent of the trading days over the sample period, else zero. This dummy is interacted with *Spread 1* to ascertain whether more actively traded firms encounter lower financing constraints. The results (Model 8) demonstrate that firms whose stocks are more actively traded encounter lower financing constraints. Intuitively, it is acknowledged that less frequently traded companies often have either accounting existence or shy away from the market with investors money without rendering any return/dividend. A few of them register themselves

in fictitious names, closely resembling a booming sector, and take advantage of investors' optimism by raising additional resources by seasoned/secondary offer. By limited trading of the shares of these infrequently traded companies, the market tends to 'discipline' them from their more liquid counterparts. Consequently, these firms, despite being listed on the stock exchanges, encounter relatively higher financing constraints *vis-à-vis* their actively traded counterparts.

TABLE 4 - *Robustness Tests: Size, Age, Outward Orientation and Liquidity*

Variables	Model 5	Model 6	Model 7	Model 8
	Size	Age	Export/Sales	Liquidity
Intercept	0.747 (0.963)	0.767 (0.951)	-0.047 (0.931)	0.473 (0.942)
Lag (CF/K)	-0.044 (0.291)	-0.082 (0.292)	-0.027 (0.291)	-0.017 (0.291)
Lag (S/K)	0.004 (0.001)*	0.005 (0.001)*	0.005 (0.001)*	0.004 (0.001)*
Lag (Leverage 1)	0.879 (0.689)	0.882 (0.689)	0.842 (0.690)	0.947 (0.691)
LQD1	-0.486 (0.288)***	-0.522 (0.289)***	-0.476 (0.288)***	-0.491 (0.289)***
Dummy for control *Spread 1	-0.222 (0.112)**	-0.274 (0.113)*	-0.209 (0.117)***	-0.160 (0.092)***
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
<i>Diagnostics</i>				
Number of observations	7187	7187	7187	7187
Time period	1995-2004	1995-2004	1995-2004	1995-2004
Adjusted R-square	0.150	0.160	0.150	0.170

Standard errors in parentheses

*, ** and *** indicates significance at the 1, 5 and 10% level

5. CONCLUSIONS

Recent theoretical work on capital market imperfections suggests that, because of conflicts of interests and information asymmetry between lenders and borrowers, debt introduces agency problems which in turn induce a premium for firms seeking external finance. Adverse market liquidity conditions increases firms' cost of investment by reducing their net worth and aggravating real debt burdens. Using alternate indicators of liquidity tightness, the results provide support to the fact that a liquidity contraction lowers investment, particularly for highly leveraged firms. A disaggregated response of firms according to various controls such as size, age and liquidity also supports the fact that the smaller, or for that matter, young firms or those whose scrips are relatively less traded are hardest hit by a liquidity contraction. In terms of policy implications, the analysis suggests the possibility of the existence of an alternate route for the

credit channel for monetary policy transmission which can operate through leverage. Additionally, the results are also indicative of the fact that the monetary policy measures that affect market liquidity adversely deter corporate investment and that these effects are more pronounced for small-sized, young and illiquid companies.

SAIBAL GHOSH

*Reserve Bank of India, Department of Economic Analysis and Policy,
Mumbai India*

SAURABH GHOSH

*Reserve Bank of India, Financial Markets Department, Mumbai
India*

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ABSTRACT

The paper investigates whether the effects of monetary policy on firm investment can be transmitted through leverage. The findings indicate that monetary contractions reduce investment for highly leveraged firms. The estimates imply that a 1 percentage point tightening of liquidity reduces investment by 0.4% through leverage.

JEL classification: G32, E52, C33

RIASSUNTO

*La politica monetaria influenza gli investimenti delle imprese
attraverso i rapporti di indebitamento?
Alcune evidenze microeconomiche per l'India*

Il lavoro valuta se gli effetti della politica monetaria sugli investimenti delle imprese possono essere trasmessi attraverso l'indebitamento. I risultati indicano che le contrazioni monetarie riducono gli investimenti per le imprese altamente indebitate. Le stime evidenziano come una riduzione dell'1% della liquidità riduce gli investimenti dello 0,4% attraverso l'indebitamento.