

INVESTMENT, CASH FLOW AND MANAGERIAL DISCRETION IN STATE-OWNED FIRMS

Evidence across soft and hard budget constraints

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LSE Financial Markets Group Special Paper, n.119, November 1999

Revised 23 May 2000

Abstract

In this paper we extend to state-owned enterprises the empirical work on investment-cash flow sensitivities. Our sample is a panel of Italian state-owned manufacturing firms over the period 1977-1993. The distinctive element of public firms' financial environment is the budget regime under which they operate. Our analysis of Italian institutions identifies a switch from a soft to a hard budget constraint regime in 1987, for which a critical determinant was Italy's attempt to qualify for EMU. We estimate a number of models of investment with additional cash flow terms and test for parameter constancy across budget regimes and the business cycle. We find that there is a positive correlation between investment and cash flow also for public firms, but only when the budget regime is soft. We argue that excessive managerial discretion is likely to be responsible for this correlation. We also find that the switch to a hard regime brings about an important change in the investment decisions of this panel of public enterprises.

Keywords: Capital markets imperfections, public enterprises, investment and cash flow, soft-budget constraint, business cycle, managerial discretion, Italian firms.

JEL: G32, L32, M40, G31, E32

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We gratefully acknowledge comments and suggestions from Luigi Benfratello, Robert Carpenter, Charles Goodhart, Steve Nickell, Giovanna Nicodano, Bruce Petersen, Alessandro Sembenelli, participants of the XXV EARIE conference, Copenhagen and of the DIP seminar series at the University of Turin. Elisabetta Bertero gratefully acknowledges financial support from the Nuffield Foundation.

WORKING PAPER CERIS-CNR
Anno 2, N° 10 – 2000
Autorizzazione del tribunale di Torino
N. 2681 del 28 marzo 1977

Direttore Responsabile
Secondo Rolfo

Direzione e Redazione
Ceris-Cnr
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10121 Torino, Italy
Tel. +39 011 5601.111
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Segreteria di redazione
Maria Zittino

Distribuzione
Spedizione gratuita

Fotocomposizione e impaginazione
In proprio

Stampa
In proprio

Finito di stampare nel mese di novembre 2000

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Private edition

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1. Introduction

The purpose of this paper is to investigate the impact of managerial discretion on the investment decisions of firms owned by the state and operating in competitive industries.

Our methodology consists in drawing from financial economics the framework for the study of the financing of investment and of the role of capital market imperfections. We then adapt that approach to take into account some peculiarities of investment decisions and managerial discretion in public enterprises¹.

The positive contribution of public enterprises to the post-war development of some European economies, such as France and Italy, is well documented (see, for example, Kumar, 1993, Vernon and Aharoni 1981 and Prodi 1976). This is in contrast to the equally well-documented poor performance of state-owned firms in recent decades, not only in those economies, but also in transition and developing ones. One important element contributing to poor results is the possible collusion, perceived on the increase in the last decades, between public managers and politicians (see, for example, Shleifer and Vishny, 1994). In this paper we interpret that collusion as an abuse of managerial discretion on the part of public enterprises' managers and we investigate its impact on public firms' investment. If managers and politicians collude, vote-maximising objectives - rather than the maximisation of social welfare - drive public investment. Therefore, collusion (or corruption) results in wasteful, sub-optimal investment².

We develop our empirical investigation within the theory of the determinants of investment decisions under imperfect capital markets and we analyse the sensitivity of investment to cash flow for a panel of Italian state-owned manufacturing firms over the period 1977-1993.

A distinctive aspect of the financial environment of public firms is that they normally operate under a *soft* budget constraint (Kornai 1996). A *soft budget constraint regime* is in place "wherever a funding source - e.g. bank or government - finds it impossible to keep an enterprise to a fixed budget, i.e., whenever the enterprise can extract ex post a bigger subsidy or loan than would have been considered efficient ex

¹ "Managerial discretion is the ability of managers to choose and pursue objectives and strategies that differ from those of the owners" (Aharoni, 1981, p.184). We consider taxpayers to be the owners of public firms (see Section 3). In this paper the terms *public firms*, *public enterprises* (commonly used in the public economics literature) and *state-owned firms*, *state-owned enterprises* (commonly used in the transition economics literature) are all used interchangeably to mean firms whose majority shareholder is the government. In contrast, we use the term *private firms* to mean firms not owned by the government (and not to indicate firms not quoted).

² See Stultz (1990) for wasteful investment in private firms.

ante” (Maskin, 1996). Our detailed analysis of Italian institutions confirms this, but only for the first part of our sample period. Indeed, our institutional analysis identifies in 1987 a *switch* from a soft to a hard budget constraint regime for Italian public enterprises. It also shows how European economic policy played a determinant role in bringing about that shift in Italy. Indeed, the requirements to enter the European Monetary Union and, before that, the discipline imposed by participation in the European Monetary System and the Single Market Programme pushed the Italian government towards a much tougher approach to its budget deficit.

The shift of regime allows us to carry out a natural experiment and test for differences in the investment behaviour of public firms during *soft* and *hard* budget constraint periods. In particular, we estimate an accelerator model of investment with added cash flow terms and test for parameter constancy of the financial factors across *soft* and *hard* budget constraint periods. Moreover, we analyse the interactions of the two budget regimes with different stages of the business cycle. For comparative purposes we present evidence also for private firms.

Because of the peculiarities of public enterprises, we complete the empirical work by checking the robustness of our results across a number of alternative investment models: a modified version of the accelerator model, an error correction model, an Euler equation model, and a “Q” investment model using the “Fundamental Q” of Gilchrist and Himmelberg (1995).

This paper makes three contributions. First, it extends to state-owned firms the debate on the source of capital market imperfections that might be responsible for the well-documented evidence of a positive link between investment and cash flows, holding constant underlying investment opportunities (see Hubbard 1998). To our knowledge this is the first study that enlarges that debate and investigates managerial discretion for enterprises owned by the State, which, after all, is the most important large shareholder after individual families in most economies (see La Porta, Lopez-de-Silanes and Shleifer, 1999). Second, in doing so, it makes a rigorous contribution to the currently limited and rather anecdotal evidence on the financial and investment behaviour of state-owned firms. Thirdly, it provides sound empirical evidence of the effects of a shift in budget regimes and, indirectly, of the impact of European economic integration on public firms’ investment decisions³.

The paper is divided into eight sections. Section 2 describes the theoretical framework for the analysis of the correlation between investment and cash flow of

³ See Bertero and Rondi 1999 for evidence on the effects of a change of regime on public firms’ productivity and employment.

private firms. Section 3 investigates how investment decisions and managerial discretion differ between private and public firms. Section 4 puts these differences in the context of Italian institutions and discusses the switch from a soft to a hard budget regime. Section 5 presents the investment model. Section 6 describes the dataset. Section 7 presents the empirical models and the main results. Section 8 concludes the paper.

2. The theoretical framework for the analysis of company investment

Some recent microeconomic literature has refocused attention on the determinants of company investment decisions under the assumption of imperfect capital markets (see the seminal work by Fazzari, Hubbard and Petersen, 1988). The theoretical framework for this paper draws from that literature.

Information economics and agency theory provide the theoretical foundations to explain, with two different interpretations, why empirical research has found that investment is positively correlated with cash flow or other measures of internal finance, after controlling for future investment (profit) opportunities⁴. One interpretation, the “*financing constraints hypothesis*”, explains the investment-cash flow link in terms of financial constraints arising in imperfect capital markets when investors are less informed than managers about the quality of the investment project (Myers and Majluf, 1984). With asymmetric information, costly monitoring and contract enforcement problems, a premium is added to the (unique) perfect markets cost of capital, and internal and external funds are no longer perfect substitutes. A decrease in current cash flow, by signalling a decrease in internal net worth, raises the shadow cost of capital, tightening the financing constraints. This discourages investment and leads to under-investment. So far, most empirical work in this area has found supporting evidence for the positive relationship between investment and internal finance by investigating the investment behaviour of sub-samples of firms selected to be a priori more likely to face capital-market frictions⁵.

⁴ On the importance to control for future profit opportunities in investment equations, see Nickell (1978), Schiantarelli (1996) and Hubbard (1998).

⁵ In general, empirical findings tend to be consistent with the idea that financing constraints are more binding for firms that are relatively smaller, younger, independent (i.e. not affiliated with business groups or banks), more technologically innovative, and that have lower dividend pay-out and less concentrated ownership (see Bond, Elston, Mairesse and Mulkay, 1997, Mulkay 1997, Schiantarelli and Sembenelli 2000, Chirinko and Schaller 1995 for recent empirical evidence). For a critical assessment of the methodology of splitting the sample according to ex-ante criteria, see Schiantarelli (1996) and Hubbard (1998). See also: Kaplan and Zingales (1997) for a criticism of the dividend pay-out criteria used by Fazzari, Hubbard and Petersen (1988), Fazzari, Hubbard and Petersen (2000) for a reply and Kaplan and Zingales (2000) for further discussion.

Another relevant contribution for the study of the impact of financing constraints on investment, has come recently from the literature on the micro-foundations of macroeconomics. This literature analyses the alternative channels for the transmission of monetary policy and investigates the role of changes in credit market conditions in amplifying monetary shocks (see Gertler and Hubbard, 1988; Bernanke, Gertler and Gilchrist, 1996). Following a monetary tightening or a downturn in the business cycle, the negative shock to the firm's future prospects reduces its internal net worth and the firm cuts back on investment spending because the terms of credit deteriorate. This "*financial accelerator mechanism*" predicts, therefore, that the impact of financing constraints on company investment decisions is more severe during recessions, amplifying the economic downturn.

As in the "financing constraints hypothesis", this mechanism predicts that the relationship between investment and cash flow should be positive. However, it refines it by adding that it should be stronger during recessions and that it should be more pronounced for firms that find it more difficult to credibly communicate private information⁶. Recent tests of the existence of a "financial accelerator mechanism" combine the cross-section and time-series implications of the theory. They compare the investment behaviour both across sub-samples of firms and across recessions and expansions, under the assumption that the investment cash flow relationship is (more) counter-cyclical for companies with (more) information and incentive problems⁷.

A second interpretation of the excess sensitivity of investment to cash flow, the "*managerial discretion hypothesis*", highlights the agency problems arising from the misalignment of managers' interests and shareholders' objectives (Jensen and Meckling, 1976; Grossman and Hart, 1982). In a world of perfect capital markets, private firms' investment projects are chosen according to the positive net present value criterion, with the objective of maximising shareholders' wealth. But, when ownership and control are separated, private firms' managers enjoy greater discretion in the decision-making process. As suggested by Jensen (1986)'s "free cash flow theory", in this context managers are able to overlook equity holders' wealth and, for example, invest in excess of what is needed to finance positive net present value projects. Rather than paying out dividends to shareholders, they would use cash flows to maximise their personal reputation and perquisites. Moreover, when ownership is not only separated

⁶ This so-called "flight to quality" of credit refers to the reallocation of credit from low-net-worth to high-net-worth borrowers in downturns. See Bernanke, Gertler and Gilchrist (1996).

⁷ See, for the US, Gertler and Gilchrist (1994), Kashyap, Lamont and Stein (1994), Kashyap, Stein and Wilcox (1993), and, for Italy, Rondi, Sack, Schiantarelli and Sembenelli (1998) and Rondi and Sembenelli (1999) respectively on aggregate data and panel data.

from control but also *dispersed* - e.g. in widely held quoted firms - the literature shows that the existence of free riding shareholders exacerbates managers' discretion (see Hart 1995). For firms with the severe agency problems assumed by the ownership-control separation hypothesis, the observed positive correlation between investment and cash flow, "could reflect managers' decisions to ignore signals from market valuation in favour of over-investment in growth"⁸ (Hubbard, Kashyap and Whited, 1995, p. 685).

A comparison between the financing constraints and the managerial discretion interpretations of the investment-cash flow positive correlation highlights that both consider internal and external finance imperfect substitutes. Both predict that changes in internal resources forecast changes in investment spending, holding constant firms' investment opportunities. Both assume that higher leverage implies more risk of financial distress and more risk of bankruptcy. However, they differ on the source of the capital markets imperfections. The "financing constraints hypothesis" focuses on asymmetric/hidden information problems, whereas the "managerial discretion hypothesis" focuses on agency/incentive problems resulting from the separation of ownership and control. As a consequence, although they both predict a wedge between the cost of internal and external funds, the cost of external finance is too high for the financing constraints/asymmetric information view, whereas the cost of internal finance is too low for the managerial discretion/agency cost explanation⁹. Hence, from the observed excess sensitivity of investment to cash flow, the former predicts under-investment and the latter over-investment.

This pattern of conflicting predictions persists once we transpose the analysis in the macroeconomic/business cycle context. Whereas the "financial accelerator/financing constraints hypothesis" predicts that the correlation between investment and internal finance is counter-cyclical, we argue that the impact of managerial discretion over the cycle may lead to a *pro-cyclical* relationship, stronger during booms and weaker during recessions (see also Rondi and Sembenelli, 1999). This is because managerial discretion itself can be thought to be pro-cyclical. When things go well, during booms, cash flows are higher, agency problems are, possibly, less evident to shareholders and their monitoring of managers less tight. This, in turn, implies more discretion and (more) over-investment. When things turn bad, agency conflicts sharpen, managers' discretion decreases and the opportunities to misallocate cash flow are reduced¹⁰.

⁸ This argument has been used by Kaplan and Zingales (1997) to describe the investment decisions of "financially unconstrained" companies. See also Hubbard, Kashyap and Whited (1995), Carpenter (1995) and Gugler (1997) for other attempts to discriminate between the two hypotheses.

⁹ See Kathuria and Mueller (1995) on this point.

¹⁰ This suggests, however, that there is another point on which the managerial discretion and the financing constraints hypotheses agree: that recessions do play a disciplinary role and induce firms to reduce

3. Investment decisions and managerial discretion in public firms

We have seen that *imperfections* in capital markets affect investment decisions and lead to a different pattern of explanations of their relationship with cash flows depending on whether firms are thought to be more afflicted by asymmetric information/financing constraints problems or by agency costs/managerial discretion problems. This section explores how these two problems apply to public enterprises.

Although even state firms are likely to have a pecking order in terms of cost of funds, they are generally considered “financially unconstrained” and much less dependent than private firms on the availability of internal resources. Indeed, the common view is that external finance for public enterprises is dominated by state grants and guaranteed loans, with no risk of default and no risk of bankruptcy. In many countries, including Italy, public firms are not even legally obliged to pay out dividends to the state-shareholder. In other words, in the context of the empirical work testing the “financing constraints hypothesis” (Fazzari et al., 1988), public enterprises could belong to a sub-sample of “the ultimately unconstrained firms” (see Kaplan and Zingales, 1997). And, if that paradigm holds, their investment should be independent of cash flow.

However, in Bertero and Rondi (1999) we show that, when public firms operate under a *hard* budget constraint regime, they do respond to financial pressure by increasing productivity and reducing employment. Consequently, public firms’ behaviour can be affected by financial factors and the above view that public firms are financially unconstrained is only appropriate when these firms operate under a *soft* budget constraint.

Once adjustments are made to take into account the different and more complex context in which public managers operate, the managerial discretion hypothesis is, on the other hand, of great relevance for public enterprises. The equivalent for public firms of the maximisation-of-shareholders’-wealth objective is the maximisation of a more complex social welfare function, which is a combination of *two constrained* objectives. The first is exactly the same as for private firms and is the maximisation of taxpayers’ wealth, driven by the *profit and efficiency motive*. The second, a direct consequence of the mandate of public firms (Sappington and Stiglitz, 1989), is the fulfilment of the *industrial or economic policy objectives* - set by the government - of growth and employment maximisation and regional development. An important implication of the pursuit of this objective – and we come back to it below and in the next section - is that public investment is likely to be counter-cyclical.

wasteful investment.

The equivalent for public firms of the pursuit of private firms managers' own objectives is again more complex and made up of *two discretionary* components. The first is the pursuit of managers' personal perquisites, again the same as for private firms. The second, most important for this paper, is the pursuit of what we call *party-political objectives* (which should not be confused with the *policy objectives* above). These are the objectives that are driven by collusion between managers and politicians and are motivated by vote-maximising. They are the ones modelled in Shleifer and Vishny (1994)'s work. Chart 1 summarises the private and public managers' types of objectives.

Chart 1. Managers' objectives

	<i>Managers of private firms</i>	<i>Managers of public enterprises</i>
Constrained objectives	Maximisation of shareholders' wealth	1. Maximisation of taxpayers' wealth
		2. Maximisation of government policy objectives (e.g. employment and regional development)
Discretionary objectives	Maximisation of personal benefits	1. Maximisation of personal benefits
		2. Maximisation of party-political objectives (collusion with politicians)

Two points are worth noting. First, due to the multiple and often partly conflicting objectives that it entails, the maximisation of social welfare is more complex than the maximisation of shareholders' wealth. The relevant consequence for this study is that the discretion in the hand of public firms' managers has more dimensions than that of private firms' managers¹¹. Multiple and unclear objectives, complex performance measurements, greater choice of determining primary and secondary goals, all allow more room for manoeuvre and a greater temptation to pursue party-political aims and collusion.

¹¹ For example, the maximisation of growth satisfies different objectives for managers of private and public firms. Whereas for private firms' managers, in the standard finance literature, growth maximisation is only equated with empire building and excessive managerial discretion, the pursuit of growth for public firms managers is often part of the maximisation of social welfare. So, it is sometimes difficult to disentangle when growth for state firms maximises taxpayers' wealth or managers' private benefits, and when these two objectives are in conflict.

Second, because of the extreme form of dispersed ownership of public firms, their managers, exactly like managers of widely-held firms with free riding problems, enjoy little direct monitoring by shareholders. The ultimate financial owners of public firms in their chain of principals are the taxpayers, in the interest of whom social welfare and wealth should be maximised. However, taxpayers have no direct contractual property rights (see Tirole 1994), only indirect influence through the election of a government which, itself, acts as principal for state-owned firms¹². Taxpayers do not have any direct control on management and have to leave monitoring to other institutions. This, as in the case of widely-held private firms with free riding problems, results in a greater likelihood of abuse of managerial discretion.

In conclusion, the discretion that public managers enjoy - and the possibility of abusing it - is, in substance, similar to that of private firms' managers. However, given that their discretion arises from a more articulated set of objectives and given the relevance of the budget regime for the financial behaviour of public firms, its effect on the relationship between investment and cash flow and the related predictions reported in Section 2 need to be refined.

We discussed that for this study it is important to take into account the budget regime under which public managers operate. "The *budget constraint* is *soft* if the state helps the firm out of trouble. There are various means to do so: subsidies; individual exemption of taxes or other charges...; prolongation of the due credit payment, etc. The state is a universal insurance company which compensates the damaged sooner or later for every loss. The paternalistic state guarantees automatically the survival of the firm... the hardness or softness of the budget constraint reflects an attitude... [It] is an ex-ante behavioural regularity, which exerts an influence on the firms' decision" (quoted in Schmidt, 1996 from Kornai, 1979). The softness/hardness of the constraint can be of different degrees and can also change over time. Kornai (1996) discusses how the more the budget constraint moves towards a harder constraint, the more public firms are subject to financial discipline. If the firm operates in a soft budget regime, it is likely that managerial discretion is high. The financial freedom translates in the possibility of pursuing the discretionary objectives and to collude with politicians. Therefore, under the "managerial discretion/agency problems hypothesis", the prediction is that the positive relationship between investment and cash flow should be stronger under a soft budget constraint.

¹² Although, to be precise, the government ownership rights are exercised, in turn, through multiple principals in the form of different ministries (see Tirole 1994).

Also of interest is the interaction of the two budget regimes with the different stages of the business cycle. In this context, the prediction of a pro-cyclical managerial discretion and investment-cash flow relationship, discussed in Section 2, may not be appropriate for public firms. If the economy is hit by a recession, vote-seeking investment projects or initiatives to maintain or increase long term political support become more rewarding for politicians because more valuable to local voters. In a soft budget regime, therefore, collusion between public managers and politicians becomes both more tempting and more likely. Consequently, in downturns, investment would be even more sensitive to cash flow than during booms. This could possibly result in a *counter-cyclical* relationship between investment and cash flow for public firms operating under a soft budget constraint.

If, however, public firms experience a tightening of the budget constraint, we know that they respond to financial pressure (see Bertero and Rondi 1999). In other words, if, for example, budgetary requirements become a political priority and the stance of the fiscal policy becomes tighter, in both constrained and discretionary objectives the room for manoeuvre disappears. Public managers not only lose the discretion necessary for indulging in collusive behaviour, but are also less able to invest in counter-cyclical - for example growth-oriented - policy objectives. This in turn leads us to predict a weaker (i.e. pro-cyclical) correlation between investment and cash flow when public firms operate in a hard budget environment. In Figure 1 we present a graphical depiction of the investment-cash flow correlation for private and public firms under the hypothesis of managerial discretion.

4. Italian public firms, managerial discretion and budget regimes

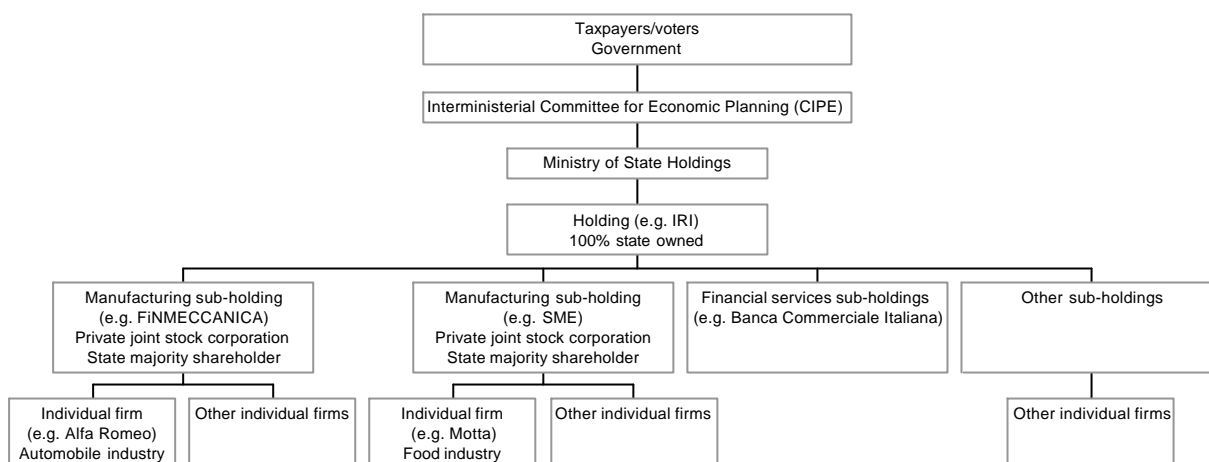
To investigate the quality and quantity of abuse of managerial discretion, we split the history of Italian public enterprises¹³ into three distinct periods: 1930s-1960s, 1970-1987, 1988 until now. Direct public intervention started in the 1930s with a number of rescue operations of distressed banks and of the manufacturing firms these banks owned (see De Cecco and Giavazzi, 1993 and Barca, 1997). The idea was to restructure firms and banks as parts of a new, diversified holding company (IRI, Institute for Industrial

¹³ As in other European countries, public enterprises in Italy play a major role in the economy accounting for around 15 percent of the non-agricultural labour force, 20 percent of value added and 25 percent of fixed investments (1991 data). The public sector controls around 70 percent of banking assets and has a major presence in many industries, services and, of course, utilities. Parts of this section draw from the institutional analysis in Bertero and Rondi (1999).

Reconstruction) and then, eventually, reinstate private ownership. After World War II, the original rescue plan was extended to promote reconstruction and to develop a full industrial policy plan of direct intervention. Two other holding companies were created, ENI (oil and gas sector) in 1953 and EFIM (mechanical engineering and mining sectors) in 1962. Saraceno (1977) makes the important point that “the political justification of this action was neither the intention to put a stop to private monopolies nor to give an impetus to certain industrial productions nor to develop depressed areas. Instead, the inability of the private sector to supply the risk capital required for controlling important industrial enterprises from sources other than commercial banks was the compelling factor for government intervention. (...) Thus, a certain pragmatism became associated with the state-held enterprises that was to remain for the life of the system”.

This system of state holdings makes Italian public enterprises particularly interesting for the study of managerial discretion and of the relationship between public managers and politicians. Whereas a nationalised industry is a direct instrument of government policy operating outside market rules, Italian state holdings were meant to operate within market conditions, in competitive sectors, with the equity participation of private shareholders (in some cases) and with the aim of safeguarding the independence of managers from the political system. Managers were outsiders with respect to political circles and were allowed to concern themselves primarily with profitability and efficiency (Barca, 1997, p. 548). The economic and public policy objectives were added by the government and had to be incorporated into final decisions (Saraceno, 1977). The interaction between managers’ and government objectives is summarised by Grassini (1981): “In general, parliament decides a policy, provides funds and sets a limit on the extent to which a state-owned firm can try to maximise its profits”. In this initial setup, the scope for abuse of managerial discretion and related collusion with politicians was limited.

The legal setup of state holdings, still in place today, reflected these principles. Italian public ownership is organised in state-owned holding companies, in turn with controlling interests in diversified sub-holdings. These own individual enterprises, in some cases with minority private shareholders (see Chart 2). The sub-holdings are mostly incorporated as private joint-stock corporations, are governed by private commercial law, follow a private accounting system and operate in a variety of competitive industries. The database for the empirical investigation of public enterprises in this study is constructed from the balance sheets of a sample of these individual firms.

Chart 2. Corporate governance of Italian public enterprises

During the first period (1930s-1960s) public firms were, by and large, profitable and operated as described above. Abuse of the discretionary managerial objectives described in Chart 1 was rare. An extensive literature, particularly by British scholars, such as Shonfield (1965), Posner and Wolf (1967) and Holland (1972), praised the management of these firms for their substantial contribution to the recovery of the Italian economy after World War II and also, paradoxically, for reinforcing competition (Martinelli 1981). The establishment in 1956 of a Ministry for State-Holdings with the mandate of spelling out the political objectives for public enterprises, was meant to separate the political from the profitability objectives. The idea was to create a filter between politicians and firms to preserve the independence of the latter (Saraceno, 1977, p. 426; Scognamiglio, 1981).

In the 1970s and 1980s, our second period, things changed. Other institutions set up in the late 1960s to reinforce that filter, did not produce the outcome for which they were intended. For example, in 1967 an Inter-ministerial Committee for Economic Planning (CIPE) was established, with the mandate to set economic and social objectives and determine investment policy for public enterprises. The Ministry for State-holdings, in turn, would translate these strategic guidelines into operational objectives for the public holdings.

However, the governance of public enterprises became excessively complicated (see Chart 2) and whereas the institutional mechanisms through which the government/shareholder communicated its objectives to firms became more transparent, a party-political “hidden shareholder” emerged (Scognamiglio, 1981). This, together

with a deteriorating world economy and other factors¹⁴, resulted in a period, between 1970 and 1987, of party-political interference in the management of public enterprises (Grassini, 1981). Political influence deeply affected strategic decisions, such as the location of new plants and appointment of top management. The 1978 law (L. 14/78) formally gave a Parliamentary committee the role of appointing the Chairmen and Vice-Chairmen of public enterprises. This implicitly legitimated the nomination of top management on the basis of an equal allocation to the relevant political parties, rather than on the basis of competence (Grassini, 1981); for example, by tradition, IRI and ENI, the two major state holdings used to be “controlled” by Christian Democrats and Socialists, respectively. All this made also the removal of top management a rather complicated political battle. Consequently, between 1965 and 1980, for example, only three Presidents were appointed at IRI.

The interaction of the above institutional changes and of two important characteristics of the post-war Italian political system - the high stability of the governing party and the high instability of governments themselves - favoured a climate of corruption and collusion. The succession of short-lived coalition governments, made of permutations of the same politicians belonging to the same large party (Christian Democrats) and a few small ones, eased the transfer of economic policy decisions from the elected government to the chairman of political parties and, more importantly, to the heads of party factions bargaining over the formation of coalitions (Filippi, 1975). All this brought about wide abuse of managerial discretion in public firms, particularly in the form of vote-maximising investment decisions to satisfy party and party-factions political objectives. Moreover, in 1974, a new law for the financing of political parties made illegal the direct and explicit financing of political parties and factions by public enterprises. Although the law aimed at preventing collusive behaviour, its effect was to eliminate the transparency of party financing and to encourage indirect and hidden contributions by managers to politicians in exchange of favours.

By the end of the 1970s, which is when our database starts, public firms' performance was characterised by poor profitability (in some cases huge losses), low productivity and high debt. In order to keep these firms in business, government funds were made available to state holdings, and redistributed to individual firms, through various sources. Among these were endowment funds (*fondi di dotazione*), which were used to recapitalise equity or for new investment. Losses were also financed with new

¹⁴For example, following the first oil shock, political and social pressures pushed state holding companies into acquiring further collapsing private companies, a procedure which contributed to fostering direct political interference and collusion.

bank debt, often provided by banks publicly-owned themselves. In addition, the effects of a number of ill-conceived laws became apparent. An example is the 1977 law (L. n. 675/77) which required state firms to estimate the shadow costs (*oneri impliciti*) they incurred by implementing “non-economic objectives”. These costs were then subsidised by the Treasury, a procedure which lent itself to abuse.

It is easy to see how, during the second period (1970-1987), given these circumstances, the budget constraint under which public enterprises operated became soft. Accommodating endowment funds, high debt, political interference and collusion between public managers and politicians, all contributed to create an environment that fits the Kornai definition of a soft budget constraint regime in a mixed economy discussed in Section 3.

However, that soft budget regime was put under pressure in the third period (1987-1990s) by a number of economic and political factors. In particular, a determinant role was played by the process towards European integration. With a mounting level of public debt, the attempt of Italy to qualify for the European Monetary Union and the EU pressure to reduce state aid and to accelerate the privatization programme triggered major changes and contributed to new and strong financial pressure on public enterprises¹⁵. They also led to changes in the relationship between public managers and politicians¹⁶.

As discussed in detail in Bertero and Rondi (1999), an analysis of these changes allows us to identify a switch to a hard budget regime in 1987. This is the first year in which the restructuring of Italian public enterprises included the closure of plants and lines of production and even the dismissal of management¹⁷. The drastic reorganization of FINSIDER - an IRI sub-holding and sector holding itself of the steel industry – and the liquidation of EFIM - the third largest state holding – finalised in 1991, are example of this new policy which made public enterprises’ managers experience for the first time a threat similar to that of bankruptcy or take-over. 1987 is also the year in which an

¹⁵ Another political factor to consider is that, in the case of Italy, excessive government spending gave rise to an anti-central government federal movement particularly vociferous in its complaints of allegedly unfair distribution of government funds between North and South. This kind of phenomenon may be related to the pressures towards decentralization described by Qian and Roland (1998), which contribute to a hardening of the budget constraint for public organizations.

¹⁶ As widely reported in the international press, a combination of these factors and the unacceptable level of corruption in the overall political system led in the early 1990s to a reform of the voting system and to a revolution in the Italian political system.

¹⁷ These policies, started at the end of the 1980s, resulted, during the 1990s, in new management structures and new procedures for the replacement of top management, based on performance and other related criteria (see Lo Passo and Macchiati, 1997 for evidence on management turnover in individual holdings).

appropriate quantitative measure of government easy financing of public enterprises, i.e. total endowment funds, collapsed. After reaching a peak of 1.08 percent of GDP in 1983, endowment funds shrank to 0.46 percent of GDP in 1985 and then collapsed to 0.09 percent of GDP in 1987. Finally, 1987 is the first year of implementation of the Single Market Program¹⁸. Our empirical work exploits the 1987 structural break, which provides an instrument for a unique natural experiment.

5. The investment model: an accelerator specification

The purpose of this paper is to investigate the role of financial factors in the investment decisions of a panel of state-owned firms. Given the complexities of these firms, for our main empirical model of company investment we choose a simple accelerator model¹⁹, as derived from the solution of the profit maximisation problem of the firm, in the absence of adjustment costs on the production factors (labour, L and capital stock, K). In Section 7.2 we then check the robustness of our main results by estimating a number of alternative investment models.

Following Jorgenson (1963), we derive an investment equation by maximising net worth and calculating the marginal productivity of capital. We find that the equilibrium condition for profit maximisation requires that the marginal productivity of capital stock equals the real user cost of capital, J_{it} .

In particular, in the profit maximization equation we use the following constant elasticity of substitution (CES) production function:

$$Y_{it} = F(L_{it}, K_{it}) = g \left[a L_{it}^{\frac{\sigma-1}{\sigma}} + b K_{it}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma v}{\sigma-1}} \quad (1)$$

where Y is the firm's output, σ is the elasticity of substitution and v is the returns to scale parameter. Taking logs and finding the first order condition for K_t , we obtain the following long run equilibrium condition for the desired capital stock as a function of real output and cost of capital:

¹⁸ Interestingly, 1987 is the year in which, for the first time, a political party advocating the particular federalist views described in footnote 15 managed to have candidates in the parliamentary elections.

¹⁹ In using this widely tested model, we follow the approach of Bond, Elston, Mairesse and Mulky (1997). See also Mairesse, Hall and Mulky (1999).

$$k_{it} = \mathbf{q} + \left(\mathbf{s} + \frac{1 - \mathbf{s}}{\mathbf{n}} \right) y_{it} - \mathbf{s} j_{it} \quad (2)$$

with:

$$\mathbf{q} = \mathbf{s} \log \frac{\mathbf{bn}}{\mathbf{g}^{\mathbf{s}} \mathbf{s}^{-1}}$$

where k_{it} is the log of capital stock, y_{it} is the log of real output and j_{it} is the log of real cost of capital .

To ensure proportionality between capital stock and demand, we must either assume $\nu=1$ (constant returns to scale) or $\sigma=1$ (unit elasticity of substitution). If we assume constant returns to scale and $\sigma=0$, we obtain a Leontief production function and a simple accelerator model, where the capital is not affected by the user cost of capital. If we assume $\sigma=1$, the CES production function is not defined due to the zero in the denominator of the exponent. However as $\sigma \rightarrow 1$ the CES function approximates a Cobb-Douglas production function. In this case the capital stock depends positively on demand and negatively on the cost of capital. Taking first differences, and assuming that Δk_{it} can be approximated by the investment rate I_{it}/K_{it} , we obtain the basic investment equation

$$\frac{I_{it}}{K_{it}} = \Delta y_{it} - \mathbf{s} \Delta j_{it} \quad (3)$$

To account for slow adjustment of the actual capital stock to the desired capital stock, we then add dynamics to the basic equation in the form of lagged investment rate (I/K) and lagged growth rate of real sales (Δy_i). We assume that the variation in the user cost of capital as well as firm specific trends in the capital and output growth rates are captured by time-specific, α_t , and firm-specific, α_i , effects. ε_{it} is the error term. The basic specification is then:

$$\frac{I_{it}}{K_{it}} = \mathbf{b}_1 \frac{I_{it-1}}{K_{it-1}} + \mathbf{b}_2 \Delta y_{it} + \mathbf{b}_3 \Delta y_{it-1} + \mathbf{b}_4 \Delta y_{it-2} + \mathbf{a}_i + \mathbf{a}_t + \mathbf{e}_{it} \quad (4)$$

To test for the presence of financial effects, we then add to the basic specification the current and lagged cash flow to capital ratios (C_{it}/K_{it}).

As it is well known, much of the debate over the role of cash flow for investment is about the fact that cash flow may also be a forecasting variable for future investment

opportunities²⁰. In the absence of controls for expectational influences, the significance of cash flow terms is difficult to interpret. The positive correlation between investment and cash flow may occur because of the effect of financial factors on investment, but also just simply because information on cash flow helps to forecast output and therefore capital spending. In the empirical literature, the difficulty is to construct a proxy for the firm's investment opportunities.

The standard approach to isolate the information content of cash flow would be to use Tobin's Q. However, apart from the common criticism of this approach that the average observed Q may be a poor proxy for marginal Q, a more basic problem makes it unsuitable for our sample of state-owned firms: they are mostly unquoted.

An alternative methodology by Gilchrist and Himmelberg (1995) avoids using stock prices and (noisy) information from financial markets by constructing investment fundamentals (Fundamental Q), based on forecasted future profitability, using a vector autoregression (VAR) forecasting framework²¹.

Another approach to deal with the lack of stock market data, or measurement problems in the construction of Q, is to model the investment decisions by using the Euler equation which describes the firm's choice of optimal capital stock, under the assumption of perfect capital markets (see, for example, Bond and Meghir, 1994). An advantage of this framework is that rejection by the data of the standard Euler equation can be reconciled with the presence of financing constraints when proxies for changes in net worth have a role in the investment decision. However, as several authors have pointed out, the Euler approach as well has a number of drawbacks (e.g. difficult comparability of results with the reduced form literature, poor small samples properties, high sensitivity of the results to the specification). In addition, as it is based on the firm's inter-temporal first-order conditions, the Euler equation may fail to detect violations of the frictionless model for classes of firms whose overall level of investment is constrained by internal finance throughout the period (and not period-by-period)²². Beside these drawbacks, which have made it less popular among researchers in recent years²³, we do not consider the Euler approach - with its set of fragile assumptions, often too restrictive even for private firms - the obvious framework for investigating state-owned firms' investment decisions.

²⁰ See Schiantarelli (1996) and Hubbard (1998) for a thorough discussion on this issue.

²¹ Gilchrist and Himmelberg (1995) extend to a panel data setting the idea developed for time series by Abel and Blanchard (1986).

²² See Schiantarelli (1996), Gilchrist and Himmelberg (1995) and Hubbard (1998).

²³ See, for example, Mairesse, Hall and Mulkay (1999).

Returning to our choice of empirical model of investment, to control for the firm's investment opportunities (i.e. for the possibility that information on cash flow helps to forecast output, hence investment), we include in equation (4) the future growth rates of real demand, measured by the first and second lead of the log difference of production in two-digit NACE industries, Δy_{jt+1} , Δy_{jt+2} (see Rondi and Sembenelli, 1999). Therefore, our final specification is:

$$\frac{I_{it}}{K_{it}} = \mathbf{b}_1 \frac{I_{it-1}}{K_{it-1}} + \mathbf{b}_2 \Delta y_{it} + \mathbf{b}_3 \Delta y_{it-1} + \mathbf{b}_4 \Delta y_{it-2} + \mathbf{b}_5 \Delta y_{jt+1} + \mathbf{b}_6 \Delta y_{jt+2} + \mathbf{b}_7 \frac{C_{it}}{K_{it}} + \mathbf{b}_8 \frac{C_{it-1}}{K_{it-1}} + \mathbf{a}_i + \mathbf{a}_t + \mathbf{e}_{it} \quad (5)$$

where C_t/K_t and C_{t-1}/K_{t-1} are the current and lagged cash flow to capital ratio. Cash flow is defined as value added less labour cost, taxes and interest expenses.

In the empirical investigation in Section 7.1 we use this adjusted accelerator model allowing the coefficient on cash flow to vary between soft and hard budget regimes (see Section 4) and over the business cycle. We then test for parameter constancy across political and macroeconomic conditions. In Section 7.2 we then check the robustness of the results obtained with equation (5) by using a number of alternative specifications based on the other approaches described in this section.

6. Data and descriptive statistics

The database is an unbalanced panel constructed at CERIS using the balance sheet data collected by Mediobanca investment bank²⁴. The panel includes manufacturing companies, both state and privately owned, over the period 1977-1993. Reflecting the standard ownership pattern of Italian firms, most of these firms are not quoted. As a consequence we cannot construct a measure of Tobin's Q from financial markets data. The panel includes only firms with at least five consecutive observations, so that each firm has a time series of at least five and at most seventeen years. The five-year

²⁴ Firms are included in the yearly directory *Le Principali Società Italiane* (Mediobanca) on the basis of their size. Between 1977 and 1984, firms with sales greater than Lit 10bn (£3.3mn) were included, between 1985 and 1986, firms with sales of at least Lit 20bn (£6.6mn) and between 1987 and 1993, firms with sales of at least Lit 25bn (£8.3mn). Firm level data on fixed capital investment is not directly available in this dataset. Therefore investment is calculated as the difference in fixed capital assets. In turn, the replacement value capital stock series is calculated using the perpetual inventory method. 1982 was chosen as the benchmark year because in this year the "Visentini bis accounting law" required firms to evaluate the capital stock at replacement prices. For a complete description of the methodology and the database see Margon et al. (1995).

requirement is appropriate for the dynamic specification we use in the econometric section, which involves first-differencing, as well as lagging, most variables.

Firms are classified according to their ownership, which can change over time in either direction, from state-owned to private or viceversa (i.e. firms are allowed to transit between private and public ownership). Moreover, each firm is allocated to its primary industry defined according to the three-digit NACE-REV. 0 classification. Finally, whenever a major operation occurs such as mergers, acquisitions, or divestures, by construction the panel drops the observation for that year and breaks up the time series because that observation is unlikely to be comparable with the previous and following one.

For our empirical work, we separate the original panel into two sub-samples of state and private enterprises. The sub-samples consists of 150 state companies and 1168 private companies with 1278 and 9877 firm-year observations, respectively. On average state-owned firms are larger than private firms. The median public firm has Lit 49.2bn (£16.4mn) of real sales (in 1980 Lire) when it enters the sample, whereas the media private firms has 36.5 (£12.2mn). Measured in terms of employees, the median state firm has 884 workers (upon entry) and the private firm has 413. As described in Section 4, we choose 1987 as the turning point for the shift from soft to hard budget regimes. Also, our sample period includes two recessions, in years 1981-1982 and 1990-1993²⁵. We define the remaining years as expansion years. On the basis of these definitions we construct five time dummies to be used in the econometric analysis: $SOFT_t$, $HARD_t$, $REC1_t$, EXP_t , $REC2_t$.

Table 1a presents the descriptive statistics for the main variables for the panel of public firms for the entire period, for the *soft* and *hard* budget constraint periods, and for the upturn and downturns of the business cycle. We report the descriptive statistics for the investment to capital stock ratio (I/K) and the cash flow to capital stock ratio (C/K)²⁶. For comparative purposes, in Table 1b we report the same statistics for the panel of private firms.

Differences between soft and hard regimes are not particularly informative, with the median increasing during the hard years, but the third quartile decreasing in the same period. A comparison of investment ratios across the business cycle shows that the requirement for public firms to invest counter-cyclically – discussed in Section 3 - is confirmed by the data. Except for firms in the first quartile, the investment ratio is

²⁵ Recession periods are defined using the Bank of Italy's Annual Reports.

²⁶ We use end of period capital stock as a scale, as is done in other works using Italian data. This is done to minimise the serious distortion that could be introduced in the series by the high and variable Italian inflation of the 1970s and early 1980s.

higher during the recessions, especially for highly investing companies. More interestingly, the comparison between the earlier recession (in the “soft years”) and the later one (in the “hard years”) shows that the investment rates were much lower in the second downturn. This suggests that the shift in regime had an influence on the decision to pursue counter-cyclical investment policies, with public firms no longer performing their counter-cyclical role.

Turning to the cash flow to capital stock ratio, we find that Italian state firms are in line with the well-documented, generally poor performance of public enterprises²⁷. The comparison with private firms highlights this. The median cash flow rates for public firms are low and the first quartile ones are negative in every sub-period. However, the third quartile cash flow rates, compared to private firms’ median profitability, are satisfactory. As expected, the cash flow rates for state companies are much lower in the earlier recession than in the expansion period, but not in the later recession. Finally, in the hard budget constraint period, state firms appear to perform better than in the soft period.

7. Empirical investigation and results

7.1. The accelerator model specification

In this section we investigate the impact of managerial discretion on the investment decisions of the panel of Italian state-owned firms over the period 1977-1993. This period not only includes the above-mentioned structural break, but also an entire business cycle, with the first recession occurring during the soft budget period and the second during the hard regime years. Our methodology consists in estimating the adjusted accelerator model with added cash flow terms derived in Section 5, equation (5), and in investigating the correlation between investment and cash flow. We then explore how this correlation varies across the soft and hard budget periods and over the business cycle. For comparative purposes we also report results for private firms.

For estimation we use the DPD program by Arellano and Bond (1991, 1998), designed for dynamic panel data. Table 2 reports the results from the Generalised Method of Moments (GMM) first-differences one-step estimator, which eliminates the firm-specific effects by first-differencing the equations, and then uses lagged values of

²⁷ Other, unreported, descriptive statistics also show that Italian public firms tend to be much more highly leveraged than private firms. The long and short term financial debt to capital stock ratio for the entire period is 61.4% for public firms and 38.1% for private firms. The debt ratios for state companies are highest during the recessions, especially the one occurring in the soft budget period (150%). However, the less leveraged firms of the first quartile, decrease their debt ratios during the hard budget years, from 35% to 25.6%, only ten percentage points higher than private firms in the same quartile.

endogenous variables as instruments²⁸. To check for absence of serial correlation in the residuals, we use the M_1 and M_2 tests for first- and second-order correlation (Arellano and Bond, 1991) and report them for all equations. If the error term in levels is serially uncorrelated, after first-differencing, first-order, but not second-order serial correlation, is to be expected and instruments dated $t-2$ and earlier should be valid. If we find second-order serial correlation, then only instruments dated $t-3$ are valid. To control for correlation between the instruments and the error term, we also report a Sargan test of over-identifying restrictions (Sargan, 1958 and Hansen, 1982). In all equations we add time dummies to capture, among other things, the variation in the user cost of capital (see Section 5).

In Table 2 we present the results for public firms. For comparison, in Table 3 we report the results for private firms. Column (1) of both tables reports the estimated coefficients for the basic specification, as outlined in equation (5). For both public and private firms, lagged investment is positive, significant and of similar magnitude. Real sales growth is positive and significant, consistent with accelerator effects. The point estimate is larger for private firms. As noted in Section 5, we include future growth rates of industry production as a control for ex-post realisations of investment opportunities. Although only the second one for private firms, both leads of industry production for public firms enter positively. Overall, these results show sufficient underlying robustness of the estimated accelerator specification. We now turn to the relevant results from this paper's point of view.

The first new result is that the estimated coefficient on the current cash flow to capital stock ratio is positive and significant not only for private firms, as one would expect, but also for public firms. This shows that the excess sensitivity of investment to cash flow, reported in the microeconomic literature for private firms, characterises also public enterprises. As discussed in Section 2, the finding of a positive correlation between investment and cash flow is consistent with two explanations. On one hand, under the assumption of information asymmetries in the capital markets, the positive coefficient may reveal that firms face financing constraints when they have to resort to external finance, leading them to under-invest. On the other, under the assumption of "free cash flow"/managerial discretion, it suggests that managers with ample discretion, obtaining their personal benefits for example from empire-building or collusion with politicians, are strongly motivated to over-invest in growth.

²⁸ We treat all right-hand side variables in the investment equation (1) as potentially endogenous. As instruments we use variables dated $t-2$ and $t-3$. Unreported OLS and Within Groups estimates suggest the presence of significant firm-specific effects.

We now move to the core results of the paper. The long-standing debate on the meaning of a positive cash-flow coefficient in investment equations (after controlling for future investment opportunities) has been investigated mainly by testing the statistical significance of the difference between cash flow coefficients across a-priori groupings of firms. To investigate the meaning of the positive coefficient for state-owned firms we focus on the relative magnitudes of the cash flow coefficients across sub-periods. We discussed in Section 3 how state firms are more likely to be afflicted by agency problems than by financing constraints. One way to test this hypothesis is to investigate whether the role of financial factors for state companies' investment changes during soft and hard budget constraint periods. Our research strategy consists in allowing the cash flow coefficient to vary over time and test ex-ante expectations on its sign and size over the two different periods.

In column (2) of Tables 2 and 3 the cash flow to capital stock ratio is interacted with two year dummies, one for the soft and one for the hard budget regime. The former takes value one from 1977 to 1987, the latter takes value one from 1988 onwards. The results in Table 2 show that the cash flow coefficient for the soft budget years, $CF/K_{it} SOFT_t$, is positive and significant and that the one for the hard years, $CF/K_{it} HARD_t$, is not significantly different from zero. Also, $CF/K_{it} SOFT_t$ is significantly larger than $CF/K_{it} HARD_t$ ($t=1.6$). This positive and significant relationship between investment and cash flow during the soft years is consistent with the predictions of the managerial discretion hypothesis. In a soft budget regime managers have the widest discretion on the allocation of cash flow to investment spending. Consistently, the results also show that, when the regime hardens after 1987, that relationship is no longer there. Conversely, the prediction of the financing constraint hypothesis is that there should be no correlation between cash flow and investment *during the soft regime*, because in that regime public firms are thought to be financially unconstrained. In conclusion, these results show that the shift in the budget regime has an important effect on the investment decisions of state-owned enterprises.

The parallel results for private firms are presented in Table 3. The cash flow coefficients are both small and positive (although the coefficient in the soft years is not significant).

The difference in the response of investment spending to financial factors across the two regimes and the fact that, of the two recessions included in the sample, the first occurred during the soft years and the second during the hard years, provide a motivation to further the investigation into testing the financial accelerator hypothesis. We introduce a year dummy for each of the two recessions and for the expansion periods ($REC1_t$ takes the value one for the years 1981-1982 and $REC2_t$ for 1990-1993;

the expansion dummy, EXP_t , is one in all other years. In column (3) in Table 2 we allow the cash flow coefficient to vary across the two recessions and the upturn. This exercise also enables us to check whether public firms were able to comply with the policy goal of investing counter-cyclically during a recession independently of the budget regime.

The empirical evidence is less clear-cut than before, but nonetheless informative. What is of interest is the comparison of the relative magnitude and sign of the three interacted cash flow coefficients. The coefficient for the cash flow in the economic upturn, $CF/K_{it} EXP_t$, is positive and significant, but smaller than the coefficient for $CF/K_{it} REC1_t$ (not significant). Most of the upturn years and all of the first downturn years fall during the soft budget regime, when managerial discretion is high, and, as we expect, the correlation between investment and cash flow is high. However, the relative magnitudes of $CF/K_{it} REC1_t$ and $CF/K_{it} EXP_t$ suggest a counter-cyclical relationship, consistent with our hypothesis in Section 3 that, if a downturn occurs when the budget constraint is soft, there is greater likelihood of *abuse* of managerial discretion, i.e. of collusion between managers and politicians interested in exploiting the economic downturn to secure votes in the long term. This translates in a higher correlation between investment and cash flow. The negative coefficient in the second recession, $CF/K_{it} REC2_t$ (also not significant) suggests that the counter-cyclical role of public investment became more difficult to pursue once the budget constraint became more binding.

In contrast to the findings for public firms, the results for private firms in Table 3, column (3), suggest that the “financial accelerator-cum-financing constraints hypothesis” is supported by empirical evidence for the sample of private firms. During the two recessions investment is correlated with cash flow. Both $CF/K_{it} REC1_t$ and $CF/K_{it} REC2_t$ are positive, significant and significantly larger than $CF/K_{it} EXP_t$. Interestingly, the point estimates for the first recession is significantly larger than the coefficient for the second recession. This is consistent with the fact that, during the first recession, the fall in GDP and industrial output was more pronounced.

On the whole, the empirical findings show that the investment-cash flow relationship for this panel of state companies over time is likely to be due to the existence of managerial discretion/incentive problems leading firms to over-invest during the years which we define as “soft”, when these firms were, for the most part, financially unconstrained (see Section 3). Consistently with this interpretation, we find that the *switch* from a soft to a hard budget constraint results in a change of the impact of cash flow over investment. This suggests that public managers become more cautious in their investment decisions.

7.2. *Alternative model specifications.*

Because of the complexities of public enterprises discussed in Section 3, we want to check further the robustness of our results, particularly those regarding the relevance of cash flow on investment across the two budget regimes. We therefore extend and complete the empirical work in Section 7.1 by estimating alternative econometric models of company investment for the sample of state-owned firms²⁹. The models we use are: a modified version of the accelerator model estimated above, an error correction model, a “Q” investment model which uses the “fundamental Q” following Gilchrist and Himmelberg (1995) and, finally, an Euler equation model. Tables A1, A2, A3 in the appendix report the results. All equations use the GMM first-differences estimator. We discuss here the results for the specification which investigates the soft versus hard investment behaviour (column 2 in the tables).

We start from a modified version of the accelerator model in equation (5). As a control for future investment opportunities, we use here the leads of firm real sales growth instead of the leads of industry production growth. In order to include two leads of sales growth in our model, we had to eliminate from the panel firms that did not match the appropriate requirement for a dynamic specification (see section 6). As a consequence we are left with 91 state firms with at least seven consecutive observations. As table A1 shows, the leads of firm sales do not work as well as the future industry production, with only the first lead approaching significance. However, the results regarding the role of cash flow across budget regimes and the business cycle remain the same. In particular, the main empirical finding that the cash flow term is positive and highly significant only in the soft budget constraint period is supported by the data.

We also estimate an error correction model of investment. Table A2 reports the GMM results. The empirical model we have estimated follows Bond et al. (1997) and takes the form:

$$\frac{I_{it}}{K_{it}} = \mathbf{b}_1 \frac{I_{it-1}}{K_{it-1}} + \mathbf{b}_2 \Delta y_{it} + \mathbf{b}_3 \Delta y_{it-1} + \mathbf{b}_4 (k_{it-2} - y_{it-2}) + \mathbf{b}_5 y_{it-2} + \mathbf{b}_6 \frac{C_{it}}{K_{it}} + \mathbf{b}_7 \frac{C_{it-1}}{K_{it-1}} + \mathbf{a}_i + \mathbf{a}_t + \mathbf{e}_{it} \quad (6)$$

²⁹ This strategy of checking thoroughly the robustness of results by providing a battery of estimations of different investment models is along the lines of Bond et al. (1997) and Mairesse, Hall, Mulkey (1999).

The advantage of this approach is that it retains (long run) information in the levels of output and capital stock. Conversely, a potential disadvantage is that, when financial terms are included, the model does not control for the possibility that cash flow may be a forecasting variable for the firm's investment opportunities. The results in column (2) show that the error correction mechanism works as expected – the coefficient for $(k_{it-2} - y_{it-2})$ is negative and significant, suggesting that when the capital stock is greater than the desired level, the firm decreases the investment rate in the future (and *viceversa*). Constant returns to scale are rejected, as shown by the significant coefficient on the level of y_{it-2} ³⁰. The results for the role of cash flow across budget regimes again hold, with the coefficient for cash flow in the soft period positive and highly significant and the one for the hard period not significantly different from zero, although positive this time.

For completeness, in a set of unreported regressions, we estimate the “Fundamental Q” model proposed by Gilchrist and Himmelberg (1995). Following this approach we constructed an alternative proxy for marginal Q, using a two-equation forecasting model composed of (gross operating) profit to capital and sales to capital ratios³¹. By including the fundamental Q in the investment equation, one can find whether the added cash flow is an independent “fundamental” variable which explains investment (see, for example, Hubbard 1998). In particular, our main findings on the cash flow terms are consistent with the previous evidence. Cash flow enters positively in all specifications and, more to the point, its coefficient is positive and significant only in the soft budget constraint period, with a point estimate of 0.042. Conversely, our measure of the “fundamental Q” enters negatively in the investment equation. This result probably shows that this approach is unsuitable for state-owned firms, with their wide-ranging objectives including non-profit and counter-cyclical ones (see Section 3, see Chart 1).

Finally, we estimate an Euler equation model. This, in principle, is the approach that better accounts for the lack of stock market based information, although, in section 5 we noted that it may not be the most appropriate for state-owned firms. We follow the specification outlined in Bond and Meghir (1994)³² :

$$\left(\frac{I}{K}\right)_{it+1} = \mathbf{b}_1\left(\frac{I}{K}\right)_{it} - \mathbf{b}_2\left(\frac{I}{K}\right)_{it}^2 - \mathbf{b}_3\left(\frac{\Pi}{K}\right)_{it} + \mathbf{b}_4\left(\frac{Y}{K}\right)_{it} + \mathbf{a}_i + \mathbf{a}_t + \mathbf{e}_{it+1} \quad (7)$$

³⁰ These results are similar to those reported for the UK in the cross-country comparison by Bond et al. (1997).

³¹ See Franzosi (1999) for an application to the private firms in the CERIS panel dataset.

³² See also Rondi, Sembenelli and Zanetti (1994) for an application to Italian company data.

Π_i is the gross operating profits (value added – labour costs). Y_i is the firm's output.

The derivation of the model shows that, in the absence of financial constraints, $\beta_1 \geq 1$, $\beta_2 \geq 1$, $\beta_3 > 0$ and (under constant returns to scale) $\beta_4 \geq 0$. In table A3 we present the empirical results that we obtained using the GMM SYSTEM estimator available in DPD98 (Arellano and Bond, 1998). As shown in Blundell and Bond (1998), the GMM SYSTEM estimator helps to mitigate the weak instrument problem that may arise when lagged levels of the endogenous variable are used as instruments for an equation in first-differences (as in the standard GMM). By estimating a system of equations in first differences and in levels (where lags of variables in levels and in first-differences are used as instruments, respectively) it is shown that efficiency gains can be obtained, particularly with short sample periods and persistent series³³.

The results in table A3 show that the coefficients on the lagged investment terms are correctly signed and significant, though smaller in absolute value than predicted by the theory. Regarding the cash flow and budget regimes, the interesting result here is that our main results are confirmed: the coefficient in column (2) on the gross operating profits term when interacted with the soft budget period dummy is positive and approaching significance, and its point estimate is much larger than the coefficient for the hard period. Regarding the interaction between cash flow and business cycle, the specification in column (3) provide further interesting results. $CF/K_{it} REC1_t$ and $CF/K_{it} EXP_t$ are both positive and significant and the former is significantly larger than the latter. Conversely, the point coefficient for the later recession, $CF/K_{it} REC2_t$, is not statistically significant. These results provide empirical evidence for the hypothesis that the correlation between investment and cash flow is counter-cyclical during the soft period, suggesting *abuse* of managerial discretion (collusion between managers and politicians, see Section 3). Moreover, the different results obtained for the first and second recessions provide supporting evidence for the interpretation discussed in Section 3. When the budget constraint hardens, managers lose the room for manoeuvre necessary to pursue *discretionary* (personal and party-political) objectives or to indulge in vote-seeking behaviour by politicians interested in exploiting the economic downturn (see Chart 1). On the other hand, it may also be argued that they also lose the possibility of pursuing *constrained* policy objectives, including counter-cyclical investment and growth-oriented projects.

In conclusion, our main results regarding the interaction between cash flow and budget regimes show robustness across the main investment models in the literature.

³³ We have used the GMM SYSTEM estimator on other specifications in this paper and found improvements in precision on the coefficient of the lagged dependent variable in most cases, but particularly in the estimation of the Euler equation.

8. Conclusions

This paper extends the literature on the impact of financial factors on company investment to the case of public enterprises by investigating the correlation between their investment and cash flow. Understanding the interaction between financial factors and *public firms'* investment is particularly important for two policy-related reasons. On one side, the dynamics and constraints of public investment play a crucial role in development and growth, especially in developing and transition economies. On the other, investigating how financial factors affect public firms' investment - and in what way it differs from private firms - is relevant for an understanding of what incentives could improve their performance, of the regulatory mechanisms for privatised utilities and of the potential effects of privatisation.

The distinctive element of the financial environment of public firms is the budget regime under which they operate. This study tests whether the correlation between investment and cash flow varies across soft and hard budget constraint regimes and also over the business cycle. Our empirical work contributes to the current debate in two ways. First, it provides econometric evidence of the impact on the investment decisions of public enterprises of a shift in budget regimes. In doing so, it also reveals the important role played by European integration and, in particular, by the requirements for participating in the European Single Market programme and for entering the European Monetary Union. Second, it extends to public firms the investigation of those sources of capital markets imperfections developed in the financial economics literature - i.e. the "asymmetric information/financing constraints hypothesis" and the "managerial discretion/free cash flow hypothesis" - that might be responsible for a positive correlation between investment and cash flow.

The paper discusses the similarities between state-owned enterprises and widely-held quoted firms in the context of this literature and argues that public enterprises can also be afflicted by excessive managerial discretion. It also discusses how, due to the multiple objectives of public firms and the related different context in which public managers operate, this excessive discretion is related to constrained or discretionary objectives. In particular, among the discretionary objectives, the pursuit of party-political aims leads to collusion between public managers and politicians. We interpret collusion and corruption, major obstacles in the efficient functioning of today's public enterprises, as an abuse of managerial discretion.

Our empirical approach consists in the estimation of an accelerator model of investment, with additional cash flow terms, using an unbalanced panel of 150 state-owned firms, operating in competitive industries, over the period 1977-1993. Because of the

complexities of public enterprises and because, to our knowledge, this is the first investigation of these aspects of their investment behaviour, we check the robustness of our findings to other model specifications used in this literature. For each specification we allow the coefficient on cash flow to vary across different sub-periods, testing for parameter constancy. On the basis of our analysis of the Italian institutional context, we split our sample period into a soft budget constraint period (1977-1987) and a hard budget constraint period (1988-1993). Moreover, we explore the interaction between budget regime and business cycle, exploiting the fact that our sample includes a full business cycle with the first recession falling during the soft budget years and the second during the hard budget years.

Our main results show that both the shift in the budget regime and the fluctuations in the business cycle have an impact on state firms' investment decisions. They may be summarised as follows:

- i. We find that the established empirical finding for private firms - that investment is positively correlated with cash flow - holds also for public enterprises;
- ii. We find that there is a difference in this correlation during soft and hard budget regimes. The coefficient in the soft period is positive and highly significant, confirming the hypothesis of a high degree of managerial discretion in the soft regime. It is also significantly larger than the cash flow coefficient in the hard budget regime period. This coefficient, however, is not significantly different from zero, showing that, when the financing constraints for public enterprises become tighter and public managers' discretion decreases, that link is no longer there.
- iii. We find that there is some evidence of a counter-cyclical investment cash-flow relationship during the soft budget constraint regime. In other words, the vote-seeking collusion between public managers and politicians characterises the first recession in the soft budget period, but not the second recession which falls during the hard budget period.
- iv. We find that the empirical findings supporting the hypothesis of excessive managerial discretion in the soft budget constraint period are robust to a number of other specifications, the error correction model, the Euleur approach and the "fundamental Q" approach.

In conclusion, our results show that, under the soft budget regime, the investment-cash flow relationship for this panel of Italian public enterprises is consistent with the "managerial discretion hypothesis". And the shift from a soft to a hard budget regime brings about an important change in the investment decisions of public enterprises, with managers losing the discretion necessary to indulge in collusion, empire building and wasteful investment.

These findings are important empirical evidence of the effectiveness and political trade-offs of a switch of government budget regime and also of the indirect, but nonetheless strong, impact of the European Single Market programme and the European Monetary Union on the behaviour of public enterprises.

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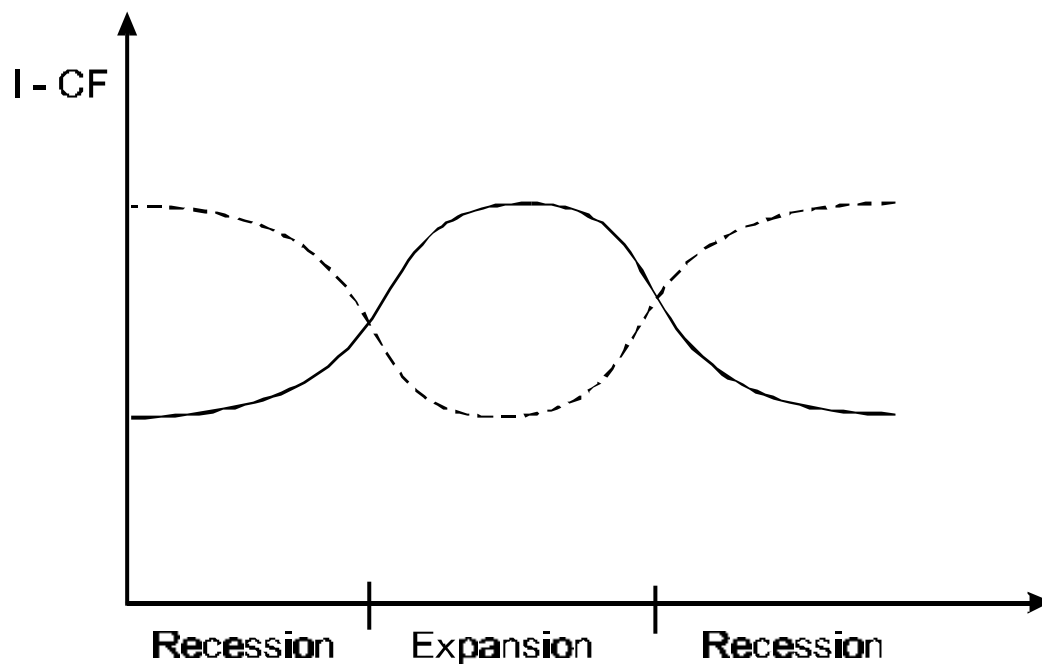
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Figure 1 - Managerial Discretion and the Investment-Cash Flow Relationship over the Business Cycle for Private and Public Firms



—— Private Firms with severe agency problems: MD pro-cyclical and I-CF correlation pro-cyclical

- - - - Public Firms with Soft Budget Constraint: I-CF counter-cyclical

Table 1a - Summary statistics for firm characteristics: 150 state-owned firms

	<i>Full Period</i>	<i>Soft Budget Period</i>	<i>Hard Budget Period</i>	<i>Recession 1981-82</i>	<i>Expansion</i>	<i>Recession 1990-93</i>
<i>Total Sample (1977-1993) n. obs.</i>	1278	924	354	183	896	199
<i>Estimation Sample (1981-1993) n. obs.</i>	678	426	252	137	386	155
I/K						
I Quartile	0.053	0.054	0.048	0.054	0.055	0.054
Median	0.088	0.084	0.093	0.104	0.083	0.091
III Quartile	0.139	0.143	0.132	0.197	0.126	0.133
CF/K						
I Quartile	-0.098	-0.114	-0.062	-0.234	-0.057	-0.104
Median	0.033	0.021	0.045	-0.039	0.043	0.037
III Quartile	0.096	0.098	0.092	0.092	0.098	0.089

Table 1b - Summary statistics for firm characteristics: 1168 private firms

	<i>Full Period</i>	<i>Soft Budget Period</i>	<i>Hard Budget Period</i>	<i>Recession 1981-82</i>	<i>Expansion</i>	<i>Recession 1990-93</i>
<i>Total Sample (1977-1993) n. obs.</i>	9877	5611	4266	994	6254	2629
<i>Estimation Sample (1981-1993) n. obs.</i>	5205	2268	2937	542	2595	2068
I/K						
I Quartile	0.050	0.052	0.048	0.054	0.053	0.046
Median	0.087	0.088	0.085	0.089	0.089	0.082
III Quartile	0.131	0.132	0.130	0.150	0.128	0.132
CF/K						
I Quartile	0.029	0.034	0.027	-0.287	0.051	0.016
Median	0.090	0.106	0.080	0.074	0.110	0.071
III Quartile	0.162	0.181	0.142	0.170	0.180	0.133

Legend:

I/K: Investment to Capital Stock ratio

CF/K: Cash Flow to Capital Stock ratio

Soft Budget Period: 1977-1987

Hard Budget Period: 1988-1993

Expansion: 1977, 1978, 1979, 1980, 1983, 1984, 1985, 1986, 1987, 1988, 1989

"Soft" Recession: 1981-82; "Hard" Recession: 1990-91-92-93

Table 2 - Investment equations: 150 state-owned firms

GMM estimates in first differences

Dependent variable $(I/K)_{it}$

	(1)	(2)	(3)
$(I/K)_{it-1}$	0.142 (1.712)	0.158 (1.921)	0.162 (1.823)
Δy_{it}	0.125 (3.042)	0.064 (1.630)	0.061 (1.562)
Δy_{it-1}	-0.036 (-1.400)	-0.035 (-1.316)	-0.030 (-1.185)
Δy_{it-2}	0.036 (1.597)	0.041 (1.876)	0.042 (2.055)
Δy_{jt+1}	0.120 (1.792)	0.102 (1.630)	0.095 (1.478)
Δy_{jt+2}	0.245 (1.707)	0.304 (1.862)	0.322 (2.094)
$(C/K)_{it}$	0.038 (2.530)	-	-
$(C/K)_{it-1}$	0.010 (0.641)	-	-
$(C/K)_{it} \cdot \text{SOFT}_t$	-	0.077 (2.016)	-
$(C/K)_{it} \cdot \text{HARD}_t$	-	-0.081 (-0.862)	-
$(C/K)_{it} \cdot \text{REC1}_t$	-	-	0.072 (0.414)
$(C/K)_{it} \cdot \text{EXP}_t$	-	-	0.050 (1.818)
$(C/K)_{it} \cdot \text{REC2}_t$	-	-	-0.053 (-0.518)
M_1	-3.289 [113]	-3.373 [113]	-3.884 [113]
M_2	-1.069 [91]	-0.927 [91]	-0.811 [91]
Sargan	77.3 [74]	61.4 [54]	64.7 [56]
<i>p value</i>	(0.37)	(0.23)	(0.20)

Instruments for col. (1): Gmm $I/K_i(2,3)$, Gmm $C/K_i(2,3)$, Gmm $K_i(2,3)$, Δy_{it-2} , Δy_{it-3} , Δy_{jt-2} , Δy_{jt-3}

Instruments for col. (2): Gmm $I/K_i(2,3)$, Gmm $K_i(2,3)$, $\Delta C/K_{t-2} \cdot \text{SOFT}_t$, $\Delta C/K_{t-3} \cdot \text{SOFT}_{t-1}$, $\Delta C/K_{t-2} \cdot$

HARD_t , $\Delta C/K_{t-3} \cdot \text{HARD}_{t-1}$, $C_{t-2} \cdot \text{SOFT}_t$, $C_{t-2} \cdot \text{HARD}_t$, Δy_{it-2} , Δy_{it-3} , Δy_{jt-2} , Δy_{jt-3}

Instruments for col. (3): Gmm $I/K_i(2,3)$, Gmm $K_i(2,3)$, $\Delta C/K_{t-2} \cdot \text{REC1}_t$, $\Delta C/K_{t-3} \cdot \text{REC1}_{t-1}$,

$\Delta C/K_{t-2} \cdot \text{EXP}_t$, $\Delta C/K_{t-3} \cdot \text{EXP}_{t-1}$, $\Delta C/K_{t-2} \cdot \text{REC2}_t$, $\Delta C/K_{t-3} \cdot \text{REC2}_{t-1}$,

$C_{t-2} \cdot \text{REC1}_t$, $C_{t-2} \cdot \text{EXP}_t$, $C_{t-2} \cdot \text{REC2}_t$, Δy_{it-2} , Δy_{it-3} , Δy_{jt-2} , Δy_{jt-3}

Legend:

One-step estimates. T-statistics in round brackets. All standard errors are robust to time series and cross-section heteroskedasticity.

M_1 = Test for first order correlation in the residuals (normal distribution).

M_2 = Test for second order correlation in the residuals (normal distribution).

Sargan = Sargan test of the correlation of the instruments with the error term (χ^2 distribution).

Degrees of freedom in square brackets.

Table 3 - Investment equations: 1168 private firms
 GMM estimates in first differences
 Dependent variable $(I/K)_{it}$

	(1)	(2)	(3)
$(I/K)_{it-1}$	0.142 (3.071)	0.164 (3.576)	0.121 (2.683)
Δy_{it}	0.360 (4.227)	0.359 (3.790)	0.310 (3.526)
Δy_{it-1}	0.039 (1.812)	0.041 (1.879)	0.036 (1.751)
Δy_{it-2}	0.043 (2.341)	0.042 (2.226)	0.040 (2.288)
Δy_{jt+1}	-0.025 (-0.595)	-0.019 (-0.435)	-0.010 (-0.239)
Δy_{jt+2}	0.079 (1.744)	0.080 (1.718)	0.085 (1.872)
$(C/K)_{it}$	0.036 (6.420)	-	-
$(C/K)_{it-1}$	-0.002 (-9.783)	-	-
$(C/K)_{it} \cdot \text{SOFT}_t$	-	0.027 (0.801)	-
$(C/K)_{it} \cdot \text{HARD}_t$	-	0.011 (2.136)	-
$(C/K)_{it} \cdot \text{REC1}_t$	-	-	0.267 (7.228)
$(C/K)_{it} \cdot \text{EXP}_t$	-	-	-0.029 (-1.313)
$(C/K)_{it} \cdot \text{REC2}_t$	-	-	0.039 (9.006)
M_1	-6.450 [926]	-6.416 [926]	-6.610 [926]
M_2	1.841 [745]	2.081 [745]	1.800 [745]
Sargan	81.7 [75]	65.6 [55]	67.2 [57]
<i>p value</i>	(0.28)	(0.16)	(0.17)

Instruments for col. (1): Gmm I/K_i (2,3), Gmm C/K_i (2,3), Gmm K_i (2,3), Δy_{it-2} , Δy_{it-3} , Δy_{jt-1} , Δy_{jt-2} , Δy_{jt-3}
 Instruments for col. (2): Gmm I/K_i (2,3), Gmm K_i (2,3), $\Delta C/K_{t-2} \cdot \text{SOFT}_t$, $\Delta C/K_{t-3} \cdot \text{SOFT}_{t-1}$, $\Delta \text{CF}/K_{t-2} \cdot \text{HARD}_t$,
 $\Delta C/K_{t-3} \cdot \text{HARD}_{t-1}$, $C_{t-2} \cdot \text{SOFT}_t$, $C_{t-2} \cdot \text{HARD}_t$, Δy_{jt-1} , Δy_{it-2} , Δy_{it-3} , Δy_{jt-2} , Δy_{jt-3}
 Instruments for col. (3): Gmm I/K_i (2,3), Gmm K_i (2,3), $\Delta \text{CF}/K_{t-2} \cdot \text{REC1}_t$, $\Delta C/K_{t-3} \cdot \text{REC1}_{t-1}$,
 $\Delta C/K_{t-2} \cdot \text{EXP}_t$, $\Delta C/K_{t-3} \cdot \text{EXP}_{t-1}$, $\Delta C/K_{t-2} \cdot \text{REC2}_t$, $\Delta C/K_{t-3} \cdot \text{REC2}_{t-1}$,
 $C_{t-2} \cdot \text{REC1}_t$, $C_{t-2} \cdot \text{EXP}_t$, $C_{t-2} \cdot \text{REC2}_t$, Δy_{jt-1} , Δy_{it-2} , Δy_{it-3} , Δy_{jt-2} , Δy_{jt-3}

Legend:

One-step estimates. T-statistics in round brackets. All standard errors are robust to time series and cross-section heteroskedasticity.

M_1 = Test for first order correlation in the residuals (normal distribution).

M_2 = Test for second order correlation in the residuals (normal distribution).

Sargan = Sargan test of the correlation of the instruments with the error term (χ^2 distribution).

Degrees of freedom in square brackets.

APPENDIX

Table A1 - Investment equations: 91 state-owned firms (Leads of Real Sales Growth)

Sample period 1983-1993
GMM estimates in first differences
Dependent variable $(I/K)_{it}$

	(1)	(2)	(3)
$(I/K)_{it-1}$	0.096 (1.174)	0.092 (1.145)	0.098 (0.986)
Δy_{it}	0.120 (1.742)	0.119 (1.652)	0.139 (1.721)
Δy_{it-1}	-0.034 (-1.006)	-0.044 (-1.203)	-0.033 (-0.851)
Δy_{it-2}	0.046 (1.470)	0.038 (1.343)	0.044 (1.477)
Δy_{it+1}	0.024 (0.413)	0.055 (1.140)	0.050 (0.874)
Δy_{it+2}	-0.005 (-0.082)	0.012 (0.189)	-0.024 (-0.277)
$(C/K)_{it}$	0.056 (3.148)	-	-
$(C/K)_{it-1}$	-0.020 (-0.516)	-	-
$(C/K)_{it} \cdot \text{SOFT}_t$	-	0.060 (3.189)	-
$(C/K)_{it} \cdot \text{HARD}_t$	-	-0.132 (-0.933)	-
$(C/K)_{it} \cdot \text{REC1}_t$	-	-	0.113 (0.348)
$(C/K)_{it} \cdot \text{EXP}_t$	-	-	0.064 (4.950)
$(C/K)_{it} \cdot \text{REC2}_t$	-	-	-0.090 (-0.400)
M_1	-2.061 [71]	-2.092 [71]	-2.425 [71]
M_2	-1.425 [61]	-1.332 [61]	-1.316 [61]
Sargan	50.8 [43]	56.0 [49]	52.9 [46]
<i>p value</i>	(0.19)	(0.23)	(0.23)

Instruments for col. (1): Gmm I/K_i (2,3), Gmm k_i (2,3), C/K_{it-2} , C/K_{it-3} , Δy_{jt-1} , Δy_{jt-2} , Δy_{jt-3} , Δy_{it-2} , Δy_{it-3}

Instruments for col. (2): Gmm I/K_i (2,3), Gmm k_i (2,3), $\Delta C/K_{t-2} \cdot \text{SOFT}_t$, $\Delta C/K_{t-3} \cdot \text{SOFT}_{t-1}$, $\Delta C/K_{t-2} \cdot \text{HARD}_t$, $\Delta C/K_{t-3} \cdot \text{HARD}_{t-1}$, $C_{t-2} \cdot \text{SOFT}_t$, $C_{t-3} \cdot \text{SOFT}_{t-1}$, $C_{t-2} \cdot \text{HARD}_t$, $C_{t-3} \cdot \text{HARD}_{t-1}$, Δy_{jt-1} , Δy_{jt-2} , Δy_{jt-3} , Δy_{it-2} , Δy_{it-3}

Instruments for col. (3): Gmm I/K_i (2,3), Gmm k_i (2,3), $\Delta C/K_{t-2} \cdot \text{REC1}_t$, $\Delta C/K_{t-3} \cdot \text{REC1}_{t-1}$, $\Delta C/K_{t-2} \cdot \text{EXP}_t$, $\Delta C/K_{t-3} \cdot \text{EXP}_{t-1}$, $\Delta C/K_{t-2} \cdot \text{REC2}_t$, $\Delta C/K_{t-3} \cdot \text{REC2}_{t-1}$, $C_{t-2} \cdot \text{REC1}_t$, $C_{t-3} \cdot \text{REC1}_{t-1}$, $C_{t-2} \cdot \text{EXP}_t$, $C_{t-3} \cdot \text{EXP}_{t-1}$, $C_{t-2} \cdot \text{REC2}_t$, $C_{t-3} \cdot \text{REC2}_{t-1}$, Δy_{jt-1} , Δy_{jt-2} , Δy_{jt-3} , Δy_{it-2} , Δy_{it-3}

Legend:

One-step estimates. T-statistics in round brackets. All standard errors are robust to time series and cross-section heteroskedasticity.

M_1 = Test for first order correlation in the residuals (normal distribution).

M_2 = Test for second order correlation in the residuals (normal distribution).

Sargan = Sargan test of the correlation of the instruments with the error term (χ^2 distribution).

Degrees of freedom in square brackets.

Table A2 - Investment equations: 150 state-owned firms (Error Correction Models)
 GMM estimates in first differences
 Dependent variable $(I/K)_{it}$

	(1)	(2)	(3)
$(I/K)_{it-1}$	-0.146 (-1.607)	-0.107 (-1.089)	-0.130 (-1.849)
Δy_{it}	-0.006 (-0.118)	0.007 (0.110)	-0.021 (-0.363)
Δy_{it-1}	-0.184 (-1.879)	-0.114 (-1.744)	-0.154 (-1.880)
$k_{it-2} - y_{it-2}$	-0.217 (-4.137)	-0.197 (-3.854)	-0.233 (-4.506)
y_{it-2}	-0.332 (-2.772)	-0.234 (-2.986)	-0.332 (-3.515)
$(C/K)_{it}$	0.038 (3.159)	-	-
$(C/K)_{it-1}$	0.030 (2.338)	-	-
$(C/K)_{it} \cdot SOFT_t$	-	0.081 (2.397)	-
$(C/K)_{it} \cdot HARD_t$	-	0.041 (0.884)	-
$(C/K)_{it} \cdot REC1_t$	-	-	0.170 (2.123)
$(C/K)_{it} \cdot EXP_t$	-	-	0.017 (0.395)
$(C/K)_{it} \cdot REC2_t$	-	-	-0.044 (-0.529)
M_1	-2.980 [113]	-2.662 [113]	-3.701 [113]
M_2	-0.896 [91]	-1.022 [91]	-0.843 [91]
Sargan	68.1 [71]	48.0 [49]	50.8 [50]
<i>p value</i>	(0.57)	(0.51)	(0.44)

Instruments for col. (1): Gmm I/K_i (2,3), Gmm $(k-y)_i$ (2,3), Gmm C/K_i (2,3).

Instruments for col. (2): Gmm I/K_i (2,3), Gmm $(k-y)_i$ (2,3), $C/K_{t-2} \cdot SOFT_t$, $C/K_{t-3} \cdot SOFT_{t-1}$, $C/K_{t-2} \cdot HARD_t$, $C/K_{t-3} \cdot HARD_{t-1}$

Instruments for col. (3): Gmm I/K_i (2,3), Gmm $(k-y)_i$ (2,3), $C/K_{t-2} \cdot REC1_t$, $C/K_{t-3} \cdot REC1_{t-1}$, $C/K_{t-2} \cdot EXP_t$, $C/K_{t-3} \cdot EXP_{t-1}$, $C/K_{t-2} \cdot REC2_t$, $C/K_{t-3} \cdot REC2_{t-1}$

Legend:

One-step estimates. T-statistics in round brackets. All standard errors are robust to time series and cross-section heteroskedasticity.

M_1 = Test for first order correlation in the residuals (normal distribution).

M_2 = Test for second order correlation in the residuals (normal distribution).

Sargan = Sargan test of the correlation of the instruments with the error term (χ^2 distribution).

Degrees of freedom in square brackets.

Table A3 - Investment equations: 150 state-owned firms (Euler Equation Models)
 GMM SYSTEM estimates in first differences
 Dependent variable $(I/K)_{it}$

	(1)	(2)	(3)
$(I/K)_{t-1}$	0.586 (1.865)	0.593 (1.837)	0.758 (2.434)
$(I/K)^2_{t-1}$	-0.168 (-1.539)	-0.171 (-1.521)	-0.203 (-1.725)
$(Y/K)_{t-1}$	0.000 (0.111)	0.000 (0.087)	-0.004 (-1.146)
$(\Pi/K)_{t-1}$	0.032 (1.251)	- -	- -
$(\Pi/K)_{t-1} \cdot \text{SOFT}_t$	- -	0.033 (1.293)	- -
$(\Pi/K)_{t-1} \cdot \text{HARD}_t$	- -	-0.031 (-0.332)	- -
$(\Pi/K)_{t-1} \cdot \text{REC1}_t$	- -	- -	0.309 (4.414)
$(\Pi/K)_{t-1} \cdot \text{EXP}_t$	- -	- -	0.033 (1.945)
$(\Pi/K)_{t-1} \cdot \text{REC2}_t$	- -	- -	-0.040 (-0.582)
M_1	-2.090 [113]	-2.098 [113]	-2.440 [113]
M_2	-0.016 [91]	-0.007 [91]	-0.606 [91]
Sargan	125.0 [109]	122.4 [108]	118.7 [107]
<i>p value</i>	(0.14)	(0.16)	(0.21)

Instruments for col. (1): Equations in first differences: Gmm I/K_i (2,3), Gmm $(I/K)^2_i$ (2,3), Gmm Π/K_i (2,3), Y/K_{it-2} , Y/K_{it-3} , k_{it-2} , k_{it-3} , y_{it-2} , y_{it-3} . Equations in levels: $\Delta I/K_{it-1}$, $(I/K)^2_{it-1}$

Instruments for col. (2): Equations in first differences: Gmm I/K_i (2,3), Gmm $(I/K)^2_i$ (2,3), Gmm Π/K_i (2,3), Y/K_{it-2} , Y/K_{it-3} , k_{it-2} , k_{it-3} , y_{it-2} , y_{it-3} . Equations in levels: $\Delta I/K_{it-1}$, $(I/K)^2_{it-1}$

Instruments for col. (3): Equations in first differences: Gmm I/K_i (2,3), Gmm $(I/K)^2_i$ (2,3), Gmm Π/K_i (2,3), Y/K_{it-2} , Y/K_{it-3} , k_{it-2} , k_{it-3} , y_{it-2} , y_{it-3} . Equations in levels: $\Delta I/K_{it-1}$, $(I/K)^2_{it-1}$

Legend:

One-step estimates. T-statistics in round brackets. All standard errors are robust to time series and cross-section heteroskedasticity.

M_1 = Test for first order correlation in the residuals (normal distribution).

M_2 = Test for second order correlation in the residuals (normal distribution).

Sargan = Sargan test of the correlation of the instruments with the error term (χ^2 distribution).

Degrees of freedom in square brackets.

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