



# Institutional Determinants of Investment-Cash Flow Sensitivities in Transition Economies

KLAUS GUGLER & EVGENI PEEV

University of Vienna, BWZ-Bruenner str. 72, Vienna A-1210, Austria.  
E-mail: evgeni.peev@univie.ac.at

We estimate investment-cash flow models for a large sample of firms in 13 transition economies over the period 1993–2003, and find that (1) investment-cash flow sensitivities decline over transition years; (2) for state-owned firms, in early transition the investment-cash flow sensitivity is negative, which we interpret as being consistent with soft budget constraints; (3) privatised firms invest efficiently; and (4) foreign-controlled firms are less financially constrained than other firms.

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## INTRODUCTION

In developed countries, the rationale for a low investment-cash flow sensitivity is that firms have proper access to external sources of finance due to their high reputational capital, low managerial discretion (MD) and low asymmetric information (AI) problems with external providers of capital. The observed investment patterns in the post-communist transition, however, challenge traditional investment theories. Some authors claim that ‘larger firms had virtually unlimited access to capital’.<sup>1</sup> Other authors show

<sup>1</sup> See, for example, Lizal and Svejnar (2002) for the Czech Republic. This study explored data provided by the Czech Statistical Office over the period 1992–1998.



that 'firms which made losses were not liquidity constrained and were still able to draw upon external funds'.<sup>2</sup> In a similar vein, a study on Russia reveals a negative relationship between internally generated cash flows and investment in members of financial-industrial groups (Perroti and Gelfer, 2001).

In this paper we argue that in the post-communist transition, there are other factors to consider regarding the link between internally generated cash flows and investment due to the peculiar *institutional* environment, namely: (1) the underdeveloped financial sector; (2) the motivation of the state to bail out both the state-owned banks and firms; and (3) the hardening of the budget constraint over transition years (Kornai, 2001).<sup>3</sup> We study the institutional determinants of investment performance of both listed and non-listed firms in 13 transition economies in Central and Eastern Europe (CEE) over the period 1993–2003. In particular, we estimate investment-cash flow models using the accelerator model of investment and augmenting it with cash flow terms. The literature on investment-cash flow regressions was criticised on the grounds that cash flow merely proxies for future investment opportunities, and thus a positive investment-cash flow coefficient does not say anything about cash constraints (Kaplan and Zingales, 1997, 2000). This paper addresses this critique by deriving institutional hypotheses and testing them in the post-communist transitional environment. For example, the hardening of the budget constraint in transition countries implies a decreasing investment-cash flow sensitivity over time, which we find in the data. One cannot sensibly explain this finding by cash flow becoming a poorer and poorer proxy for future investment opportunities over transition.

The paper addresses three major questions. Is there evidence of a hardening of the budget constraint over the transition years? What are the effects of privatisation and more generally of ownership change on the investment-cash flow sensitivity? How do different ownership categories (state, foreign investors, domestic firms, financial institutions and privatisation funds) affect investment behaviour?

The rest of the paper is structured as follows. The next section discusses our hypotheses and the econometric modelling. The subsequent section

<sup>2</sup> See Budina *et al.* (2000) for Bulgarian firms over the period 1993–1995 using the Amadeus dataset.

<sup>3</sup> Most papers on corporate investment behaviour in transition countries focused on the early transition period. For example, see Lizal and Svejnar (2002) and Budina *et al.* (2000), Konings *et al.* (2002) for firms in Poland, the Czech Republic, Bulgaria and Romania during 1994–1999. Some studies examine late transition, for example, see Mueller and Peev (2007) for 151 publically listed firms in 10 transition economies during 1999–2003.



describes the data and sample characteristics. The fourth section presents the econometric results. The penultimate section scrutinises the soft budget constraint phenomenon by discussing state-controlled firms in more detail. The final section concludes.

## HYPOTHESES AND ECONOMETRIC MODELLING

### Asymmetric information, managerial discretion and soft budget constraint in transition

In the neoclassical model of investment, the neoclassical cost of capital and firm investment opportunities are the only determinants of investment. The usual criticism of the neoclassical approach is based on the overwhelming empirical evidence that internal cash flows co-determine investment. Many studies find a positive link between internally generated cash flows and company capital investment.<sup>4</sup> Two theories have been put forward to explain investment dependence on corporate liquidity, the AI theory (see Myers and Majluf, 1984; see Fazzari *et al.*, 1988 for the first empirical test) and the MD theory (Grabowski and Mueller, 1972).<sup>5</sup> The AI theory assumes that firms cannot reach their optimal investment level due to financial constraints (ie firms under-invest), while the MD theory predicts that firms reinvest too much of their internal funds and pay out too little in dividends (ie firms over-invest).<sup>6</sup>

In the transitional institutional environment, there may be a third explanation, the soft budget constraint. According to Kornai *et al.* (2003), the difference between a hard and a soft budget constraint is as follows. A firm has a budget constraint; it must cover its expenditures out of its initial endowment and revenue. If it fails to do so, deficit arises. The firm faces a *hard budget* constraint as long as it does not receive support from other organisations to cover its deficit. The *soft budget* constraint (SBC) occurs if one or more supporting organisations (eg government, banks) are ready to cover all or part of the deficit. At the beginning of the 1990s, the dominance of the state in the non-financial sector and financial centralisation made the high degree of the SBC inevitable. The transition process can be seen as hardening the budget constraint (Kornai, 2001). This transformation has several features.

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<sup>4</sup> For a survey of empirical studies, see Chirinko (1993), Mueller (2003, pp. 177–179), and Gugler (2005).

<sup>5</sup> For recent studies applying both AI and MD theories, see Gugler *et al.* (2004a).

<sup>6</sup> Various proxies of financial constraints are used, like dividend payments (Fazzari *et al.* 1988); firm affiliation to business groups (Hoshi *et al.*, 1991); age, ownership concentration, and membership in an interrelated group (Chirinko and Schaller, 1995).



(1) The first steps are the introduction of legislation for imposing financial discipline, for example, bankruptcy laws and commercial laws, and the development of the court system to ensure efficient law enforcement. (2) Privatisation is a necessary condition for hardening the budget constraint, but not a sufficient one (Kornai, 2001). The crucial point is that the new private owners have fewer links with the state and fewer expectations of state assistance. (3) A tight macroeconomic policy (eg tight monetary and fiscal policy, introduction of currency board, and the like) was also helpful. (4) Finally, the move from a centralised to a decentralised credit system hardened the budget constraint considerably (Dewatripont and Maskin, 1995). For example, Hungary was a successful story with fast decentralisation and privatisation of the banking sector to foreign investors in 1994–1995. In contrast, the financial crisis in Bulgaria in 1996–1997 was due to the delay of bank privatisation and establishment of ‘crony’ links among the state-owned banks, government, and firms. Among all these factors, the development of the financial sector plays a crucial role for the supply of funds to investment activities of non-financial firms.

### Hypotheses

The AI theory is tied to the existence of thinner equity markets and less developed banking sectors in CEE countries. We expect that AI problems decrease over time as financial sectors develop. MD may also decrease over time if the institutional environment and firm corporate governance strengthens. Thus, both AI and MD developments lead to decreasing investment-cash flow sensitivity in transition countries. Under the MD theory, managers of a large, mature company with limited investment opportunities invest beyond the point where the value of its shares is maximised. To the extent that companies in Western countries face hard budget constraints as a system-specific feature of any developed economy (Kornai, 2000), overinvestment will be constrained by levels of internal cash flows. If companies in transition countries can also raise external capital to finance low return investments due to the existence of SBCs, then MD problems may be even more severe in these countries than in the West (Mueller and Peev, 2007). Any hardening of the budget constraint over transition, thus, leads to lower MD.<sup>7</sup>

**Hypothesis 1.** *The investment-cash flow sensitivity decreases over time in transition countries.*

<sup>7</sup> A hardening of the budget constraint should only affect over-investing firms. Under-investing firms (firms with cash constraints) do have rates of return larger than their cost of capital, thus they already have a hard budget constraint.



Studies of ownership structures and performance in developed economies usually assume that ownership structures are relatively constant for the given period of time during which the performance data are collected (several years routinely) (see Mueller *et al.*, 2003). Although ownership change is a key element of enterprise reform in post-communist transition, there are only a few empirical studies on post-communist transition that address ownership change patterns and their effects on performance.<sup>8</sup>

The typical change in property-rights of socialist state-owned enterprises in the early transition was the so-called ‘corporatisation’ or their transformation into companies with a 100% state participation (Peev, 1995). This was a transitory stage after the withdrawal of the state from firm affairs and before the firm’s privatisation. Managers of state-owned commercialised firms had a high degree of MD and state-owned firms had soft budget constraints (Kornai, 2001). The soft budget constraint implies distorted investment behaviour in three major dimensions. First, overinvestment by loss-makers having access to soft loans by state-owned banks, the latter bailed out by the government. Second, underinvestment by potential profit-makers due to financial re-allocation by the government, also to support loss-makers. Third, there was asset-stripping (decapitalisation) of. In all the cases, internally generated cash flows are either not relevant for investment decisions or suggest a *negative* relation between investment and cash flow.<sup>9</sup>

**Hypothesis 2.** *State-owned firms display zero or negative investment-cash flow coefficients over transition.*

The common view is that privatisation should harden the budget constraint. Boycko *et al.* (1996) present a model in which privatisation effectively drives a wedge between managers and politicians. In this model, privatisation leads to ‘depoliticization’ and makes it too costly for politicians to subsidise the firms.

**Hypothesis 3.** *In privatised firms, there is a weaker relation between investment and internally generated funds than in other firms.*

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<sup>8</sup> See, for example, Jones and Mygind (1999) for ownership change in Estonia; Grosfeld and Hashi (2003) for the Czech Republic and Poland; Mueller *et al.* (2003) for Bulgaria. For the differences in corporate performance depending on ownership concentration, see, for example, Hanousek *et al.* (2007).

<sup>9</sup> We may expect that corporatised state firms face harder budget constraint than state-owned enterprises. However, our data have limitations to separate the state firms into these two groups, thus we use a total sample of all state-owned firms.



A common approach for examining the impact of ownership on investment in transition economies is to apply a rather narrow typology of owner identities classifying firms into three groups: state-owned, private, and foreign-owned.<sup>10</sup> A few studies focus on other ownership categories and their effects on investment.<sup>11</sup> In transition countries, a common view is that firms controlled by foreign investors have easier access to external finance and Western markets. We thus expect less severe AI problems in firms under foreign control compared to domestic firms. Financial owners may also mitigate the AI problems between managers and external capital markets.

**Hypothesis 4.** *Firms controlled by foreign investors have a weaker relation between investment and internally generated funds than firms controlled by domestic investors.*

**Hypothesis 5.** *Firms controlled by financial institutions have a weaker relation between investment and internally generated funds than firms controlled by non-financial owners.*

Finally, firms controlled by privatisation funds have ownership structures similar to corporate pyramids. Pyramid ownership structures consist of a chain of owners with an ultimate owner who has control over a firm through a controlling stake at each level. The literature reveals that the typical agency issues include expropriation of small shareholders through income shifting (Morck *et al.*, 2000), tunnelling (Johnson *et al.*, 2000), and large shareholder entrenchment. Studies also show that corporate pyramids are involved in cash flow redistribution activities among affiliated firms developing internal capital markets and decreasing the link between company investment and internal cash flows.<sup>12</sup>

**Hypothesis 6.** *Firms controlled by privatisation funds display a weaker relation between investment and internally generated funds than other firms.*

<sup>10</sup> Among recent contributions see, for example, for Hungary, Colombo and Stanca (2006) for 4,333 firms over the period 1989–1999 and Perroti and Vesnaver (2004) for 56 public companies in the period from 1992 to 1998. Among the early studies, see, for example, Grosfeld and Nivet (1997) for 173 large firms in Poland during 1988–1994. The authors distinguished three types of enterprises: state-owned, ‘commercialised’, and privatised.

<sup>11</sup> See, for example, Perroti and Gelfer (2001). The authors examine the controlling role of banks in financial-industrial groups in Russia. They study 71 public companies in 1995 and find a negative correlation between investment and cash flow in bank-led groups. The authors explain this result with extensive reallocation of funds and use of profitable firms as cash cows.

<sup>12</sup> For discussion on the agency issues related to the corporate pyramid structures, see Morck *et al.* (2005).



### Econometric modelling

Investment models usually differ in how they: (i) identify investment opportunities of the firm and measure the marginal returns on investments; (ii) measure the cost of capital. A recent overview of empirical studies applying different investment theories ranks the performance of four investment models (accelerator, neoclassical, q-model, and cash flow) and concludes that: ‘... On the marginal return side, quantity variables like output as implied by the accelerator theory seem to outperform both price variables and expectations variables like Tobin’s q. On the cost of capital side, cash flow outperforms the various measures of the neoclassical cost of capital. The best equation for explaining investment at the firm level probably combines accelerator and cash flow variables’ (Mueller, 2003, pp. 179–180).

We test the hypotheses presented above by estimating a simple investment accelerator-cash flow model, linking cash flow, sales growth (a proxy for investment opportunities), and ownership structures to investment. All of the independent variables are lagged one period to avoid their being partly endogenous. Financial variables are scaled by the firm’s capital stock to eliminate size effects. The basic equation may be written as:

$$I_t/K_{t-1} = a + b \times CF_{t-1}/K_{t-1} + c \times 1/t \times CF_{t-1}/K_{t-1} + d \times S_{t-1}/K_{t-1} + e \times S_{t-2}/K_{t-1} + \mu i_t \quad (1)$$

where  $I$  is investment in property, plant and equipment measured by the change in the capital stock (proxied by tangible fixed assets – item 3, Amadeus data base, Formula of accounts and ratios) plus depreciation (item 42).  $K$  is the book value of capital stock measured by tangible fixed assets.  $CF$  is cash flow measured by net profit after tax (item 39) plus depreciation (item 42),  $S$  is total annual sales (item 25). By including the one and two period lags of  $S$  (and normalising by lagged capital stock), we effectively control for sales growth but additionally allow for differential impacts of the two lags on investment (including only a lagged sales growth term constrains  $e = -d$ ).

By estimating (1) for different sub-samples of firms we can test the hypotheses discussed above. We test the *change* in the impact of cash flow on investment over time by including an interaction term of cash flow and one over time,  $t$ .<sup>13</sup> A positive coefficient on this interaction term implies that as time progresses the interaction term puts consecutively less weight on cash flow. Thus a positive coefficient indicates declining connection of cash flow to investment over time. Since we define  $t$  as taking on the value of one in 1995,

<sup>13</sup> See Mueller (1986) for a similar approach.



two in 1996 and so on until a value of  $t$  of 9 in 2003, the cash flow influence in the year 1995 is estimated as the sum of the coefficients on  $CF/K$  and  $1/t \times CF/K$  with  $t = 1$ , that is  $b + c$ . In the year 2003, we estimate a cash flow influence of  $b + 1/9 \times c$ . In the long run, as  $t$  goes to infinity and the interaction term disappears, the cash flow influence is estimated to be  $b$ .

## DATA AND SAMPLE CHARACTERISTICS

The main databases that we will use are the 1997–2005 versions of *Amadeus*.<sup>14</sup> In our study, we define seven ownership categories using various Amadeus database ownership types. (1) Non-financial firm (industrial company and holding); (2) Financial (bank, insurance company, mutual fund, pension fund, and other financial institution); (3) Family (individual or family); (4) State (state, municipality, state agency); (5) Privatisation fund (privatisation fund, holding-ex-privatisation fund); (6) Foreign; (7) Dispersed. We define a company to be in dispersed ownership if the largest owner holds less than 10% of the outstanding shares.

Table 1 presents summary statistics of the main variables used in the subsequent regression analysis. We restrict our sample of firms to the same sample for which we run the basic regressions. Overall, we have information on nearly 25,000 firms from 13 CEE countries giving rise to over 90,000 observations. The balance sheet data start in 1993 and end in 2003. Amadeus database converts all accounting and market data to US dollars using annual exchange rates. We use balance sheet and income statement variables already converted into US dollars, deflate these variables by the Consumer Price Index and express all the financial variables in real 1995 US dollars. To reduce the effects of outliers, all variables are capped at the 1 and 99 percentiles of the distribution. Panel A of Table 1 presents descriptive statistics by countries. The average (median) firm has 13.7 million USD (2 million USD) in total assets. The average (median) firm displays an investment to capital stock ratio of 21.7% (2%), and cash flow to capital stock ratios of about 34.5% (15.6%). The average firm grows at a 28.2% rate (sales), median firm sales is 6.5% over the sample period. All this implies that there are some firms that are particularly successful to invest, earn cash flows and grow, however that the median firm is not. Moreover, there is a lot of variation across countries

<sup>14</sup> Amadeus is a Pan-European financial database, containing balance sheet, income statement, and ownership structure information on over 250,000 major public and private companies in all sectors in more than 30 European countries. The *Amadeus* ownership database provides basic information about the company owners, namely: identification number, name, type, nationality, and percentage of ownership stake (Ownership Database, Bureau van Dijk Electronic Publishing, 2004).



**Table 1:** Summary statistics

	No. firms	No. obs.	Total assets (in the USD)		Investment (I/K)		Cash flow (CF/K)		Sales growth ( $S_t - S_{t-1} / S_{t-1}$ )	
			Mean	Median	Mean	Median	Mean	Median	Mean	Median
<i>A. Country</i>										
Bulgaria	2,804	11,978	4,864	770	0.233	0.022	0.179	0.112	0.39	0.127
Serbia & Montenegro	288	820	28,158	6,227	0.132	-0.012	0.169	0.099	0.194	0.075
Czech Rep	3,161	15,465	17,589	4,238	0.196	0.038	0.347	0.164	0.286	0.05
Estonia	359	1,549	9,396	3,559	0.369	0.128	0.769	0.322	0.411	0.158
Croatia	820	2,551	24,536	6,680	0.342	0.068	0.407	0.147	0.273	0.15
Hungary	1,593	5,038	11,412	3,475	0.397	0.173	0.509	0.278	0.654	0.132
Latvia	16	29	27,062	4,876	0.31	0.146	0.4	0.309	0.27	0.165
Poland	3,339	9,729	19,988	5,087	0.258	0.091	0.36	0.193	0.113	0.049
Romania	6,257	27,731	2,128	836	0.19	-0.158	0.426	0.164	0.209	0.006
Russian Fed.	2,084	4,274	81,679	4,291	0.161	-0.008	0.369	0.191	0.438	0.198
Slovenia	211	933	33,637	16,734	0.118	0.060	0.254	0.186	0.121	0.032
Slovakia	31	126	91,080	50,220	0.105	0.030	0.213	0.181	0.179	0.051
Ukraine	4,146	10,121	10,228	1,705	0.156	0.017	0.149	0.081	0.27	0.086
Total	25,109	90,344	13,700	2,037	0.217	0.02	0.345	0.156	0.282	0.065
<i>B. Year</i>										
1995		1,712	20,360	3,865	0.033	-0.114	0.225	0.11	1.328	0.304
1996		5,911	7,976	1,822	0.035	-0.179	0.376	0.117	-0.047	-0.069
1997		7,977	6,628	1,144	0.02	-0.105	0.492	0.151	0.394	-0.09
1998		9,150	8,496	1,485	0.239	-0.026	0.289	0.133	0.323	0.105
1999		10,452	8,043	1,481	0.309	0.046	0.31	0.164	0.007	-0.142
2000		13,317	10,600	1,666	0.232	0.018	0.353	0.184	0.335	0.036
2001		15,621	9,888	1,946	0.219	0.007	0.357	0.174	0.24	0.079
2002		14,810	20,071	2,872	0.309	0.085	0.32	0.153	0.338	0.146
2003		11,394	30,555	3,944	0.23	0.053	0.324	0.152	0.354	0.175
Total		90,344	13,700	2,037	0.217	0.02	0.345	0.156	0.282	0.065

*Notes:* The table includes firms for which we have balance sheet and income statement data. All the variables are measured in real 1995 US dollars. Total assets are in thousands dollars. *I* is investment in property, plant, and equipment measured by the change in the capital stock (proxied by tangible fixed assets – item 3, Amadeus data base, Formula of accounts and ratios) plus depreciation (item 42). *K* is the book value of capital stock measured by tangible fixed assets. *CF* is cash flow measured by net profit after tax (item 39) plus depreciation (item 42), *S* is total annual sales (item 25). *I/K* is investment divided by capital stock. *CF/K* is cash flow divided by capital stock.





with the lowest median investment rate in Romania (−16%) and the largest in Hungary (17%). Panel B of Table 1 shows descriptive statistics by years. The so-called ‘asset stripping’ or decapitalisation of assets (declining of the book value of capital stock) was a typical phenomenon observed in early transition years. In our sample of firms, we may clearly identify the early transition stage (till 1998) when the median investment rates are particularly low (and negative) and the years after that when the median investment rates are positive. A breakdown of investment rates by country and year reveals that the de-capitalisation was particularly severe in Bulgaria, Romania, Russia, and Ukraine in this early phase of transition (not shown in the table).

Table 2 provides summary statistics on ownership concentration and identities of largest owners. We report ownership characteristics of the subset of all firms with ownership data in any year over the period studied. The ownership data start in 1995 and end in 2005. Ownership concentration as measured by the share of the largest owner is very high with a mean of 67.9% and a median of 70%. The high degree of ownership concentration is typical also for developed countries in Continental Europe.<sup>15</sup> Moreover, the breakdown of ownership concentration by years indicates that the concentration of ownership remains high throughout the sample period (not shown in the table).

Also in Table 2, we identify the basic ownership categories, domestic firms, financial institutions, families, the state, privatisation funds, foreigners (mostly foreign firms), and dispersed. On average, domestic firms control 28% of firms, domestic financial institutions only 1.5%, families 14%, the state or state agencies 20%, privatisation funds 14%, and foreign firms 20%. Only 2.5% of firms have dispersed ownership. While in the early years of transition state control is prevalent in all countries (around 60%–80% in 1996–97), direct state control diminishes to 10%–20% in 2003–2005 (not shown in the table).<sup>16</sup> At the same time, the domestic corporate sector as controlling party increases over the same period from 7%–13% to 28%–56%.

Table 3 displays a transition matrix of the evolution of largest owners for a balanced sub-sample of 3,620 firms from 1996/1997 to 2001 and thereafter.<sup>17</sup> We report the patterns of ownership change and our sample is

<sup>15</sup> For empirical evidence on the high ownership concentration of listed firms in Western Europe, see, for example, Gugler *et al.* (2004b).

<sup>16</sup> However, the Amadeus database like other official databases has limitations to measure the ultimate state control and capture only the direct state ownership in the non-financial firms. Some studies investigate the full degree of state control in privatised firms (see eg Hanousek and Kochenda, 2008).

<sup>17</sup> For a similar transition matrix describing ownership transformation, see Jones and Mygind (1999) for Estonia and Grosfeld and Hashi (2003) for the Czech Republic and Poland.

**Table 2:** Ownership concentration and types of largest owners

Country	No firms	No. obs.	Ownership concentration (%)		Ownership types (Share)						
			Mean	Median	Firm	Financial	Family	State	Priv. fund	Foreign	Dispersed
Bulgaria	2,804	16,033	71.1	80.0	0.22	0.01	0.08	0.55	0.03	0.09	0.04
Serbia & Montenegro	288	357	70.3	75.0	0.43	0.05	0.39	0.05	0.04	0.02	0.04
Czech Rep	3,161	10,161	64.5	60.0	0.39	0.03	0.21	0.07	0.01	0.29	0.00
Estonia	359	658	78.3	98.7	0.33	0.03	0.00	0.03	0.00	0.61	0.01
Croatia	820	1,780	73.5	96.3	0.43	0.05	0.12	0.08	0.04	0.29	0.07
Hungary	1,593	5,547	65.7	66.0	0.21	0.02	0.30	0.04	0.01	0.41	0.03
Latvia	290	753	67.8	70.0	0.16	0.01	0.32	0.03	0.00	0.43	0.05
Poland	3,339	9,875	76.9	99.9	0.25	0.02	0.17	0.19	0.02	0.33	0.02
Romania	6,257	20,888	64.5	70.0	0.16	0.01	0.15	0.03	0.43	0.19	0.04
Russian Fed.	2,084	5,801	61.8	56.0	0.61	0.08	0.00	0.06	0.01	0.15	0.12
Slovenia	211	408	58.2	60.0	0.30	0.16	0.04	0.39	0.01	0.27	0.03
Slovakia	31	88	69.3	70.0	0.21	0.06	0.00	0.01	0.00	0.71	0.01
Ukraine	4,146	5,806	72.6	99.5	0.47	0.01	0.02	0.40	0.01	0.07	0.05
Total	24,383	78,155	67.9	70.0	0.28	0.015	0.14	0.20	0.14	0.20	0.025

*Notes:* The table includes firms for which we have ownership data in any year over the period 1995–2005. Ownership types are as follows. (1) Firm: domestic non-financial firm (industrial company and holding); (2) Financial (bank, insurance company, mutual fund, pension fund, and other financial institution); (3) Family (individual or family); (4) State (state, municipality, state agency); (5) privatisation fund (privatisation fund, holding-ex-privatisation fund); (6) Foreign; (7) Dispersed: We define a company to be in dispersed ownership if the largest owner holds less than 10% of the outstanding shares.



**Table 3:** Transition matrix of largest owners 1996/97–2001/2005

Largest owner 1996/97	Largest owner 2001 or after							Total 1996/97
	1	2	3	4	5	6	7	
1. Firm	316	5	20	10	7	69	8	435
2. Financial	9	9	2	0	0	11	0	31
3. Family	15	2	193	0	2	25	5	242
4. State	320	6	7	381	39	52	20	825
5. Priv. Fund	702	14	132	82	494	209	45	1,678
6. Foreign	27	0	11	0	2	267	10	317
7. Dispersed	32	1	17	1	8	9	24	92
Total	1,421	37	382	474	552	642	112	3,620

*Notes:* The table includes firms for which we have ownership data in both the initial years of the sample (1996/97) and the final years (2001/05). The largest owner holds at least 10% of ownership. Type of owners: 1. Domestic non-financial holding company and non-financial firm; 2. Domestic financial institution (bank, insurance company, mutual fund, other); 3. Domestic family; 4. State; 5. Privatisation fund; 6. Foreign owners; 7. Dispersed – the largest owner holds less than 10% ownership stake. The start of ownership transformation – 1996/1997; the end of ownership transformation 2001 and thereafter.

restricted only to these firms for which we have ownership data in both the initial years of the sample (1996/97) and the final years (2001/05). Ownership/control transformation occurs in about 46% of firms (1684/3620). Some major tendencies of ownership transformation are as follows. First, the key driving force for ownership transformation was privatisation. Ownership change was observed in more than half of the state-owned firms (444/825) and about 70% of privatisation fund-controlled firms (1184/1678). Second, the state sold its assets mainly to domestic non-financial firms (320/825) and foreigners (52/825). Third, in ‘secondary’ privatisation mainly domestic non-financial firms (702/1678), foreign firms (209/1678) and domestic families (132/1678) bought the controlling stakes. Fourth, ownership transformation within the private sector occurred at a moderate rate and most cases involved ownership transfers from domestic non-financial firms and families to foreign firms.

## EMPIRICAL EVIDENCE ON INVESTMENT-CASH FLOW SENSITIVITY

Table 4 presents the main results on our investment-cash flow regression model. The table compares OLS including country fixed effects, OLS with firm fixed effects and GMM estimates. Since equation 1 contains no lagged dependent variables, and the sales and the cash flow terms are predetermined, OLS is consistent. If, however, the capital stock follows a partial



**Table 4:** Investment-cash flow sensitivity over transition: pooled sample, dependent variable:  $I_t/K_{t-1}$

	OLS with country fixed effects		OLS with firm fixed effects		GMM**	
	Coef.	t-value	Coef.	t-value	Coef.	z-value
$I_{t-1}/K_{t-2}$					0.043	9.10
$S_{t-1}/K_{t-1}$	0.024	18.15	0.034	18.63	0.065	81.53
$S_{t-2}/K_{t-1}$	-0.008	-6.29	0.012	8.36	0.005	7.52
$CF_{t-1}/K_{t-1}$	0.018	1.18	-0.007	-0.42	0.004	0.41
$1/t \cdot CF_{t-1}/K_{t-1}^*$	0.355	5.71	0.310	4.58	0.216	5.73
Constant	0.104	14.74	-0.127	-9.73	-0.025	-6.34
Nobs	90,344		90,344		59,796	
Nfirms	25,109		25,109		19,827	
$R^2$	0.111		0.481			
Sargan test					0.22	
AR(1)					0.00	
AR(2)					0.4	

Notes: For the variable definitions, see Table 1, Notes. All specifications include year dummies (not reported).

\*We define  $t$  as taking on the value of one in 1995, two in 1996 and so on until a value of  $t$  of 9 in 2003.

\*\*GMM is one-step GMM and uses all dependent variables lagged by two or more periods as well as all pre-determined variables as instruments. 'Sargan test' is the  $p$ -value of a Sargan-Hansen test of overidentifying restrictions;  $AR(k)$  is the  $p$ -value of a test that the average autocovariance in residuals of order  $k$  is zero. Z-value is coefficient divided by the standard error assuming a standard normal distribution.

adjustment process, a lagged dependent variable should be included and OLS would be inconsistent in the presence of unobserved firm-specific effects. Inconsistency of OLS would also be a problem if explanatory variables are endogenous. Thus, we also show GMM estimates.

The GMM model estimates equation 1 augmented by a lagged dependent variable using systems the GMM estimator developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). This estimator eliminates firm effects by first-differencing and controls for possible endogeneity of current explanatory variables. Endogenous variables lagged two or more periods will be valid instruments provided that there is no second-order autocorrelation in the first-differenced idiosyncratic error terms.<sup>18</sup> The Sargan tests do not suggest rejection of the over-identifying restrictions at conventional levels. While there is evidence of first-order serial correlation in the residuals, the AR(2) test statistics reveal absence of second-order serial correlation in the first differenced errors. Our GMM estimates

<sup>18</sup> Of course, it would be preferred to use a set of truly independent instrumental variables (IV) instead. It was, however, impossible for us to identify and collect a set of IVs that would vary across firms and time and that would be uniformly valid for all 13 countries in the sample.



therefore use endogenous variables lagged by two or more periods as well as all pre-determined and truly exogenous variables as instruments.

The models perform satisfactorily with the sales accelerator and the cash flow terms taking on the expected values and being highly significant. The  $R^2$  is 11% in the pooled OLS regression including only country dummies, which is satisfactory for a regression with 25 explanatory variables and more than 90,000 observations. Moreover, the inclusion of more than 25,000 firm dummies, while increasing the  $R^2$  to 48%, does not change the main results on the cash flow terms. Likewise, the main results carry over to GMM estimation.

Hypothesis 1 states that investment-cash flow sensitivities should decline over time in CEE countries. Therefore, we expect a positive coefficient on an interaction term of  $1/t$  and cash flow: as time progresses this interaction term puts consecutively less weight on cash flow, thus a positive coefficient indicates less connection of cash flow to investment in later years. Since we define  $t$  as taking on the value of one in 1995, two in 1996 and so on until a value of  $t$  of 9 in 2003, the cash flow influence in the year 1995 is estimated as the sum of the coefficients on  $CF/K$  and  $1/t \times CF/K$  with  $t=1$ , that is around 0.37 for the OLS with country fixed effects estimates (0.30 for firm fixed effects, 0.22 for GMM). In 1996 the cash flow influence is estimated at (OLS with country fixed effects)  $0.018 + 1/2 \times 0.355 = 0.2$  and so on. In the year 2003, we estimate a cash flow influence of just 0.057.<sup>19</sup> Thus, hypothesis 1 is corroborated: investment-cash flow sensitivities decline considerably over transition. The most likely reasons include the lowering of AI and MD problems as well as the hardening of budget constraints, as the financial sector develops.

Table 5 presents the results on ownership identities. We report only the results with GMM. Although we did not explicitly formulate a hypothesis on ownership change in general, it is interesting to see from the table that only those companies that changed control over transition (Non-stable) display declining investment-cash flow sensitivities. Companies that did not change control over transition (Stable) do not display declining investment-cash flow sensitivities.

Hypotheses 2 and 3 focus on the effects of state control and privatisation on investment-cash flow sensitivities. We compare stable state ownership firms (State) with privatised firms (Privatised). We restrict the privatised firms sample to those firms that were 'really' privatised and not merely put

<sup>19</sup> We observe similar results when we run yearly cross-sectional regressions. That is, cash flow coefficients reach values of more than 0.2 in 1995/1996 but only 0.05–0.1 in 2002/2003. These results are available upon request.



**Table 5:** The effects of ownership categories and change on investment- cash flow sensitivity: Dependent variable:  $I_t/K_{t-1}$

	$CF_{t-1}/K_{t-1}$		$1/t CF_{t-1}/K_{t-1}$		Nobs	No firms	Sargan test**	AR(1)	AR(2)
	Coef	z-val	Coef	z-val					
Stable*	0.050	2.49	0.061	0.84	13,243	3,792	0.34	0.03	0.22
Non-stable	-0.129	-4.60	0.566	5.04	11,282	2,945	0.22	0.01	0.83
State	0.003	0.04	-0.366	-1.50	2,138	654	0.17	0.00	0.14
Privatised	-0.013	-0.24	-0.109	-0.58	3,028	655	0.43	0.00	0.97
Foreign	-0.142	-5.04	0.574	4.83	1,498	368	0.25	0.00	0.86
Domestic	0.074	3.58	-0.031	-0.40	13,200	4,537	0.33	0.00	0.12
Financial	0.173	4.88	-0.146	-1.21	454	168	0.12	0.00	0.19
Priv. fund	-0.321	-5.32	1.539	4.78	196	60	0.23	0.00	0.53

*Notes:* The table reports the effects of ownership categories and change. Equation 1 was estimated by OLS with country-year fixed effects and GMM. All specifications include year dummies. To save space we report only the results with GMM, since they did not differ greatly from the other results. For the variable definitions, see Table 1, Notes. The table reports summary statistics of cash flow coefficients.

\*Stable: no change in control during estimation period; Non-stable: control change during period; State: state is the largest owner over the whole period; Privatised: the largest owner changes from state to non-privatisation funds; Foreign: the largest owner is investor with foreign origin; Domestic: the largest owner is domestic investor; Financial: the largest owner is bank, insurance company, mutual fund, pension fund, and other financial institution, Priv. fund: the largest owner is a privatisation fund.

\*\*GMM is one-step GMM and uses all dependent variables lagged by two or more periods as well as all pre-determined variables as instruments. 'Sargan test' is the  $p$ -value of a Sargan-Hansen test of overidentifying restrictions; AR( $k$ ) is the  $p$ -value of a test that the average autocovariance in residuals of order  $k$  is zero. Z-value is coefficient divided by the standard error assuming a standard normal distribution.

into the ownership of a privatisation fund. Hypothesis 2 posits weak or negative cash flow-investment sensitivity for state-owned firms. Table 5 shows that estimated cash flow coefficients are insignificant, partly corroborating Hypothesis 2. We will see in the next section that some types of state-controlled firms display a *negative* cash flow influence over the whole period pointing to soft budget constraints problems.<sup>20</sup> In privatised firms, the cash flow coefficient is insignificant, corroborating hypothesis 3. It appears that new owners induce efficient investment behaviour. This observation is consistent with the evidence on the positive effects of privatisation on productivity (Djankov and Murrell (2002)).<sup>21</sup>

<sup>20</sup> Again we must note that we have only data on direct ownership at hand, so we can claim our results only for directly state-controlled firms.

<sup>21</sup> In a recent survey, Estrin *et al.* (2008) summarizes 34 empirical studies published or circulated as working papers by December 2007 and show that the positive privatisation effects on performance are conditional on factors like the type of the new private owners, corporate governance, access to know-how and markets, and the like.



Hypothesis 4 states that foreign controlling owners should alleviate cash constraints compared to domestic controlling owners. This is confirmed by the empirical evidence. Table 5 shows that the cash flow coefficients for domestically controlled firms are positive, statistically significant and much higher than the cash flow coefficients for their foreign-controlled counterparts. Moreover, while the cash flow influence on investment in foreign-controlled firms decreases at a very rapid pace over time (the coefficient on the  $1/t \times CF$  term is 0.57), the investment of domestically controlled firms remains cash flow induced.

Hypothesis 5 assumes that (domestic) financial controlling owners should alleviate cash constraints *vis-à-vis* non-financial owners. This hypothesis is not corroborated by the evidence. The cash flow coefficient remains significantly positive at 0.17 and does not show any decreasing tendency over transition. It appears that domestic financial owners (banks and non-bank institutions) are not able to play the role yet which foreign owners (banks or firms) can play for their controlled firms.

Finally, hypothesis 6 states that firms controlled by privatisation funds have a weak relation between their cash flows and investment. We estimate a negative cash flow effect in the long run with a sharply decreasing tendency over transition. The negative cash flow coefficient could be partly explained by financial redistribution among firms affiliated to privatisation funds.

## SOFT BUDGET CONSTRAINT OF STATE-CONTROLLED FIRMS

Going back to Hypothesis 2, we stated that state-owned firms enjoy soft budget constraints, particularly in the early years of transition. We may separate a negative investment-cash flow coefficient due to (1) high investment in loss-making firms (overinvestment) based on soft loans from state-owned or 'crony' banks, (2) low investment in profit-making firms (underinvestment) and (3) de-capitalisation (asset-stripping), when the investment rate is negative.

Table 6, Panel A, presents summary statistics of all firms with stable state ownership and of the sub-samples of loss-making and profit-making state-controlled firms. The sub-sample of loss-making state-owned firms show striking characteristics consistent with soft budget constraints. The loss-makers are firms with (i) slightly higher than average investment rate, (ii) very low internally generated cash flows, (iii) bad investment opportunities measured by the growth of sales, and (iv) higher indebtedness.

Table 6, Panel B, reports the OLS regression results for both state-controlled loss-makers and profit-makers (we discuss only the OLS results,





**Table 6:** State-controlled firms over transition

Panel A: Descriptive statistics

	No. obs.	I/K	CF/K	Sales growth	Debt/assets	ROA
All firms	4,358	0.154	0.354	0.241	0.195	-0.017
Loss-making firms*	1,760	0.165	0.033	0.112	0.236	-0.120
Profit-making firms	2,598	0.153	0.339	0.331	0.163	0.049

*Notes.* Debt/assets is total debt divided by total assets. ROA is profit divided by total assets. For the other variable definitions, see Table 1, Notes.

\*Loss-making firms are state firms with ROA < 0; Profit-making firms are state firms with ROA > 0.

Panel B: Regressions: Dependent variable:  $I_t/K_{t-1}$

	$CF_{t-1}/K_{t-1}$		$1/t \cdot CF_{t-1}/K_{t-1}$		Nobs	No firms	$R^2$
	Coef	t-val	Coef	t-val			
Profit-making firms*							
All	0.237	2.17	-0.670	-1.83	1,648	616	0.165
High indebted	0.300	0.90	-1.000	-1.03	687	249	0.2
Low indebted	-0.114	-0.72	1.849	2.23	961	367	0.158
Loss-making firms							
All	0.522	2.29	-2.490	-2.17	978	467	0.154
High indebted	1.429	4.06	-5.518	-4.43	461	213	0.463
Low indebted	0.123	0.28	0.233	0.09	517	254	0.107

*Notes:* The table reports OLS estimates using equation 1 for the state-controlled firms. State-controlled firms are firms, which largest owner over the whole period is the state. All specifications include year dummies. The table reports summary statistics of cash flow coefficients. For the variable definitions, see Table 1, Notes.

Profit-making firms are state firms with ROA > 0. Loss-making firms are state firms with ROA < 0. High indebted firms have debt/assets ratio larger than median (0.13). Low indebted firms have debt/assets ratio lower than median (0.13).

since the GMM results are mostly consistent, but since sample sizes are very low, give rather imprecise estimates). The results strongly corroborate the soft budget constraint hypotheses in state-owned firms. Loss-making state-controlled firms display a significantly *negative* investment-cash flow sensitivity in the early years of transition (the first year in our sample of state-owned firms is 1996). The cash flow sensitivity is measured by the sum of the two cash flow coefficients.<sup>22</sup> Thus, the cash flow influence is  $\approx -2$  (0.522-2.49) in 1996. This sensitivity turns positive only after the year 2000 (ie the cash flow influence is  $\approx 0$  (0.52-1/5  $\times$  2.49) in the year 2000). State

<sup>22</sup> See the estimation procedure in the section named 'Econometric Modeling'.



loss-makers that are highly indebted (eg due to access to soft loans) are even more extreme: they have a statistically significant investment-cash flow coefficient of nearly  $-4$  (!) in 1996 (1.43–5.52), and settle spending actually more of their cash flows as time goes to infinity ( $b = 1.43$ ). The difference from those firms that are not highly indebted suggests that the main channel of softening the budget constraint is actually *via* soft loans. The access to soft loans and the consequent high indebtedness of these firms is a specific form of the soft budget constraint over the studied period.

## CONCLUSIONS

Our study on investment-cash flow sensitivities in CEE countries over the period 1993–2003 revealed several findings, which cannot be easily dismissed by the usual critique, that cash flow merely proxies for future investment opportunities (Kaplan and Zingales, 1997, 2000).

First, our estimates show that this sensitivity systematically declines over time. AI and MD problems were more severe in the early years of transition. As external capital markets and corporate governance institutions gradually develop in CEE countries, AI and MD effects are decreasing. Second, in early transition there was a negative investment-cash flow sensitivity for state-owned firms, which we explain by soft budget constraints. The major type of the inefficient investment behaviour was overinvestment of highly indebted state loss-makers. Third, we find empirical support for the efficient effects of privatisation on company investment decisions. Privatised firms do not display a significantly positive investment-cash flow sensitivity. Fourth, the identities of owners do matter. Foreign-controlled firms display a smaller investment-cash flow sensitivity than domestically controlled firms. Thus, the results support the view that foreign owners mitigate AI problems. However, the expectations for the role of domestic financial owners were not corroborated. Domestic banks and non-bank financial institutions in CEE countries are not able to relax the financial constraints of the firms they control.

This study combines the AI and MD theories with the relatively less developed soft budget constraint literature to approach post-communist transition and investment-cash flow sensitivities. The study reveals that both company institutional characteristics (ownership type and change) and country institutional environments (eg hardening of the budget constraint) matter for investment-cash flow sensitivities.



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