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# Ownership Structure, Cash Constraints and Investment Behaviour in Russian Firms

Tullio Buccellato
Gian Fazio
Yulia Rodionova

# Ownership Structure, Cash Constraints and Investment Behaviour in Russian Firms[*]

Tullio Buccellato[(a)], Gian Fazio[(b)] and Yulia Rodionova[(c)]

## Abstract

In this paper, using a large representative panel dataset of 8,637 large firms in the European part of Russia and their balance sheet information over the period 2000-2004, we investigate the extent to which Russian firms are liquidity constrained in their investment behaviour and how ownership structure changes the relationship between internal funds and the investment decisions of these firms. We estimate a structural financial accelerator model of investment and first test the hypothesis that Russian firms are cash constrained by conducting random-effects estimation. Our results confirm that firms are liquidity constrained when the ownership structure is not included in the econometric specifications. With regards to the ownership structure and the degree of ownership concentration, we find that state-owned companies, companies owned by private individuals/families and financial companies are less cash constrained, independently of whether their ownership structure is concentrated. No significant impact is found for banks and institutions.

(a) Dipartimento di Economia e Istituzioni, Universita' di Roma Tor Vergata (at the time of writing the paper).

(b) School of Slavonic and East European Studies, University College, London (at the time of writing the paper).

(c) Corresponding author: yrodionova@dmu.ac.uk. Department of Accounting and Finance, Leicester Business School, De Montfort University.

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**1. Introduction**

According to neoclassical theory, the investment behaviour of a firm is independent of its financial structure. Under the assumption of perfect capital markets, internal and external funds can be considered perfect substitutes and, hence, inter-temporal optimization can be solved regardless of financial factors. In this setting, the only factor affecting a firm's investment decision is the benefit received from an additional unit of capital relative to its replacement cost, i.e. Tobin's Q. However, empirical evidence suggests an excess reaction of investments to cash flow. One possible explanation for this stylized fact has been found in the presence of asymmetric information, which makes internal funds less costly relative to new debt or equity finance (Fazzari *et al.* 1988). In this paper, we investigate whether this is the case for Russian firms and assess the extent to which these are cash-constrained in their investment decisions, differentiating between several ownership structures. This emphasis on ownership structures and their importance for firms' financing and investment is currently all the more important an issue for Russia, where the corporate governance regime has been constantly changing since the break-up of the Soviet Union in 1992 (Buck *et al.* (1998); Buck (2003); Estrin and Wright (1999); Judge *et al.* (2003); McCarthy and Puffer (2003); Meyer (2003)). The initial attempt by reformers to create an Anglo-American shareholder type of corporate governance system failed. Various hybrid forms of the stakeholder type of corporate governance bearing similarities to the German-Japanese system emerged instead, but these also gave rise to the principal-principal problem of the abuse of minority shareholders by large shareholders and stakeholders (see also Mickiewicz, 2006). Such changes in corporate governance mechanisms could not leave unaffected the various opportunities that firms have had for financing their investment projects.

In our analysis, we employ a financial accelerator approach introduced in Gilchrist and Himmelberg (1998), which, in addition to measuring the non-financial indicators such as the expected marginal return to capital captured in Tobin's Q model, adds financial frictions as one of the state variables in the investment decision of the firm. The common proxies used for such financials are cash flow and cash stock. In a similar spirit, Love (2003) uses the financial accelerator approach to conduct a cross-country study of the relationship between the depth of a country's financial market and its level of financial development.

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According to the predictions of both models, if the firm is being financially constrained, then it will use its own internal funds to finance investment as they are a cheaper or the only available alternative. In such a case, the authors predict a positive relationship between investment as a share of capital stock and the amount of internal funds. We extend this framework by hypothesising that this relationship will vary greatly with the type of ownership (e.g., state versus private ownership by a bank, investment fund or insiders). The discussion presented in Section 2 justifies our hypothesis as the changes of ownership during the transition years have been thought of as a major driving force behind companies' performance, of which the investment decision is an important characteristic. Our findings confirm the generally accepted prior findings that firms in Russia are liquidity constrained, but that certain types of ownership make them more or less so. In our estimations we rely on panel data random- and fixed-effects procedures.

Empirical studies of the effect of ownership on firms' liquidity constraints in Russia usually go beyond merely confirming the existence of such constraints to focus mostly on the analysis of the impact of firms' participation in their financial-industrial groups (FIGs). This is the case because the ownership structure prevailing in Russian industry in the time period considered was oriented towards financial-industrial groups.

However, diversified conglomerates (financial-industrial groups) may perform differently according to the economy in question. Perotti and Gelfer (2001) argue that while in developed economies this ownership arrangement tends to underperform[2], they often prosper in developing countries. This is mainly because, in a more volatile and less transparent environment, a FIG may offer useful governance functions and may create an internal capital market which ensures management decisions are monitored. Moreover, these kinds of conglomerates may be well-positioned to capture scarcity rents through – for instance – political connections and obtain political favours such as advantageous terms (credit or licensing) and favourable regulations.

The factors that specifically determine diversified conglomerates' performance in Russia are the oligopolistic structure of industry, the underdeveloped capital market, the poor flow of information (and

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[2] In terms of the group trading at a discounted value relative to a control group; lower Tobin's Q; suboptimal allocation of resources across divisions.

investors-firm asymmetries), an undeveloped legal system and unreliable enforcement procedures. In this environment, banks have increased their ownership of industry through loans-for-shares deals and insider-dominated privatization sales.

Still, according to some authors (Johnson (1997)), FIGs lead to the lack of access to external funds due to bad governance and the limits it imposes on the scope for dispersed ownership. On the contrary, Volchkova (2000), using the financial accelerator framework to assess the effect of the firm's participation in the financial-industrial group on its liquidity constraint using a sample of 115 firms from Goskomstat in 1997-1998, finds a positive relationship between participation of a firm in the FIG and investment as a share of capital. She explains this outcome as a result of reduced moral hazard on the part of managers who do not siphon off as much cash for their personal benefit when their performance is being controlled by a partnering financial institution. Perotti and Gelfer (2001) estimate Tobin's Q model to test the importance of the firm's participation in the financial-industrial group for the dependence of its investment decisions on the internal funds on a sample of 76 Russian public companies in 1995 and 1996. They find that investment is sensitive to internal funds for the group of firms not participating in the FIG. They also find that "while investment is not significantly correlated with cash flow in industry-led group firms (unlike in independent firms), there is a negative significant correlation for bank-led firms, suggesting a more extensive financial reallocation and the use of profitable firms as cash-cows".

Our paper contributes to the existing literature in a number of ways. First, we perform estimations on a large and representative sample of 8,637 firms in the European part of Russia so that it allows us to draw conclusions about the full extent of the liquidity constraint issue facing Russian firms. Second, we extend this analysis to identify the effects of various ownership types and the degree of ownership concentration on credit constraints for all the firms surveyed.

The paper is organised as follows. Section 2 reviews some of the literature building on two main strands of studies: some are specific to the Russian experience while others consider the relationship between ownership and firms' performance more generally. In section 3 we present the structural financial accelerator

model of investment. Section 4 details our empirical analysis based on over 8,000 firms, including a description of the dataset, the model and our results. Finally, Section 5 concludes.

## 2. Historic Background, Transparency and the Insiders' Advantage

As already stated in the introduction, we expect the relationship between the firm's share of investment to capital and its financials (such as cash flow) to be affected by the type of ownership. This section sheds light on the importance of different ownership types in the business environment and firms' decisions in Russia. While changes in ownership in transition economies have been associated with improvements in firms' performance (Megginson and Netter, 2001), whether these changes materialise will also depend on the business climate of the country in question. In the case of Russia, Estrin (2002) points out that both the regulatory environment and institutional development might not have reached a level which would allow certain types of ownership to enhance performance. In particular, privatization itself did not result in beneficial changes in those sectors in which an appropriate competition policy had been implemented. In addition, financial reporting practices in Russia still lag behind the leading international accounting practices. An S&P report (quoted in Kochetygova *et al* (2004)) notes that of the 42 largest firms, only 40% of these disclose, in full, their ownership details. The present opaqueness of ownership structures is, in large part, attributable to historical reasons. The first mass privatization occurred during the Yeltsin era and, at this time, insiders could dispose of privileged information concerning the strategic standpoint of many former public firms. After having acquired an advantageous position, managers developed a strong opposition and reluctance to any reform aimed at enhancing the level of transparency.

More precisely, the main changes in ownership realized since the beginning of the transition in Russia have always moved along with the process of liberalization, which can be schematically divided into three phases. First, the early mass waves of privatisations (1992-1995) were characterised by the so called "corporate wars" in which firms often utilised dubious manoeuvres  such as false bankruptcies and improper notifications of official meetings to achieve their objectives (Kochetygova *et al.* (2004)). It is during this

period that many firms decided to allocate the majority (usually 51%) of their shares to employees and managers giving a considerable advantage to insiders.

The second stage of privatization, realized in December 1995, was the so called Loans-for-Shares Privatization scheme[3]. This latter allowed banks to acquire a large number of shares in the largest corporations and gave rise to a general lack of transparency in the bidding process, which also brought about the emergence of industrial lobbies headed by the so-called oligarchs. Finally, it has been observed that in this context management ownership appears to be limited partly because managers may hide their ownership stakes. The situation is exacerbated by the fact that managers tend to divert cash flows from the payment of dividends to hide assets and reduce the probability of takeover bids or intervention from the government (Shama, 2001; Yakovlev, 2001; Rozinskii, 2002).

Thirdly, the already precarious situation, which developed towards the end of the 1990s, was compounded by the Russian economic crisis of 1998 which had two main effects: firstly, some of the largest banks collapsed forcing some of the firms they owned into liquidation; secondly, a considerable number of foreign investors left the country. This turbulent business climate may also explain the comparatively low levels of FDI in the late 1990s, less than 1% of GDP compared with 5% to 10% for other Central and Eastern European economies (see e.g., Estrin and Wright (1999)).

Overall, privatization in Russia has resulted in the emergence of a relatively small number of very large investors. Guriev et al. (2003) estimate that the 23 largest firms in the country control at least 36% of output and employment. Interestingly, while these firms are not too dissimilar in terms of sales growth and labour productivity, they find these firms to have invested significantly more than other firms controlled by other Russian owners. This is likely to be a result of larger firms having a lower cost of capital and having a general advantage in raising funds for investment. Controlling for depreciation and balance sheet adjustments, the authors estimate growth in fixed assets (as a proxy for investment) and find the largest

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[3] "This scheme envisaged that banks would acquire the state-owned shares in 21 bluechip public companies as collateral for granting credits to the federal government. Twelve auctions were implemented under this scheme, bringing total revenue of 5.1 trillion roubles to the federal government (Radygin, 2003)."

private firms, together with foreign owned firms, to be investing considerably more than the rest (25% or 30% more) of remaining Russian firms.

Ultimately, however, insider-owned firms, in contrast to financial-industrial groups, possessed neither the managerial nor the financial resources needed to restructure their enterprises. Moreover, even when outsiders provided some external capital (in return for ownership) anecdotal evidence (in Perotti (2000)) suggests that one result has been fierce power struggles for control. Mickiewicz et al. (2004) find, using a panel of Estonian firms, that domestically owned firms are more financially constrained than foreign-owned entities and that size also plays a role, with larger firms being less constrained). Perotti and Gelfer (2001) note that the majority of the literature in this area advocates that firms with a dispersed ownership structure and/or insider control tend to be more inertial and face higher agency costs when raising finance. The central question of this paper is to explore whether financial constraints exist and, if so, how they vary for different owners and various degrees of ownership concentration.

More recently, during the Putin era, Russia has seen the re-emergence of the state as an active player in the corporate arena. The state has indeed acquired control of important firms in strategic sectors as, for example, in hydrocarbon production. This kind of state capture process brought about a new set of organizational features, leaving unchanged the underlying mechanism. In actual fact, the energy sector is witnessing the emergence of a renewed state monopoly, implying a shift from a system of oligarchic control to a system of *bureaugarchic* control of hydrocarbon revenues (Buccellato and Mickiewicz (2007)).

## 3. A Model of Investment

The model of investment used in our estimations follows Gilchrist and Himmelberg's (1998) financial accelerator model in the basic setup and the setting in Love (2003) in the assumption of no external bond financing. In the model, the firm maximizes the present discounted value of the cash flows, so that the dynamic maximization problem is given by:

$$V_t(K_t, \xi_t) = \max_{\{I_{t+s}\}_0^\infty} D_t + E_t\left(\sum_{s=1}^\infty \beta^{t+s-1} D_{t+s}\right)(1)$$

$$D_t = \Pi(K_t, \xi_t) - C(I_t, K_t) - I_t (2)$$

$$K_{t+1} = (1-\delta)K_t + I_t (3)$$

$$D_t \geq 0 (4)$$

where $D_t$ are the dividends paid to shareholders at time $t$; the first constraint represents the budget constraint on the cash flow; $\beta$ denotes the discount factor; $K_t$ is the capital stock at the beginning of period $t$; $I_t$ is period $t$'s investment; and $\delta$ is the rate of depreciation.

$\Pi(K_t, \xi_t)$ represents the maximized value (with respect to variable costs) of the profits, with the usual assumptions on the profit function, where $\xi_t$ is a productivity shock.

$C(I_t, K_t)$ denotes the adjustment costs of investment. The Lagrange multiplier (henceforth denoted $\lambda_t$) on the non-negativity of the dividends constraint represents the shadow price of paying negative dividends (i.e., of issuing equity), or the shadow cost of internally generated funds. This shadow price will later be used for the estimation of the financing constraint.

The Euler equation resulting from this optimization problem is given by:

$$1 + \left(\frac{\partial C}{\partial I}\right)_t = \beta_t E_t\left[\theta_t\left\{\left(\frac{\partial \Pi}{\partial K}\right)_{t+1} + (1-\delta)\left(1 + \left(\frac{\partial C}{\partial I}\right)_{t+1}\right)\right\}\right] \quad (5)$$

where $\partial C / \partial I$ is the marginal adjustment cost of investment, $\partial \Pi / \partial K$ is the marginal profit of capital (MPK), and $\theta_t = \frac{1+\lambda_{t+1}}{1+\lambda_t}$ is the relative shadow price of external funds in periods $t$ and $t+1$.

This equation describes the inter-temporal investment decision, since the marginal cost of today's investment (on the left-hand side, given by the cost of investment goods plus the marginal adjustment cost) has to be equal to the discounted marginal cost of investing tomorrow (the sum of today's marginal benefit

forgone, adjustment cost and the price of investment tomorrow) (Love ,2003).

As Love (2003) points out, "the firm's inter-temporal allocation of investment depends on its effective discount factor, which is given by the product of its internal discount factor β, and θ, the discount factor associated with the external finance premium". If a firm is constrained, which in the model is equivalent to the inability to pay negative dividends (i.e., to issue new equity), the shadow value of these funds rises today relative to tomorrow (i.e., $\lambda_t > \lambda_{t+1}$, ). Because of the negative dependence of $\theta_t$ on this shadow value, the effective discount rate of the firm drops and the firm postpones investment to the next period.

Financing constraints in the model are given by the parameter $\quad \theta_t = \frac{1+\lambda_{t+1}}{1+\lambda_t}$ :

In perfect capital markets[4], $\lambda_t = \lambda_{t+1} = 0$, and $\theta_t = 1$. If the capital markets are imperfect, $\theta_t$ will depend on a number of state variables, including some observable firm characteristics. Although the model does not provide an explicit formula for this factor, the relevant literature relies on an ad hoc parameterization of this parameter using indicators of the firm's financial health. Love (2003) parameterizes $\theta_t$ as a linear function of the stock of a firm's liquid assets, the stock of cash and marketable securities. We use a similar approach, while in the estimations, we scale the variable by the value of the previous period's fixed assets.

If $\lambda_t > \lambda_{t+1}$, then $\theta_t = \frac{1+\lambda_{t+1}}{1+\lambda_t} < 1$ and it serves as an additional discount factor, in the sense that the current period's funds are more expensive to use than the next period's funds, so the firm is financially constrained and $\theta_t$ indicates the degree of this financial constraint.

We use Cash Flow[5] as a measure of internal funds available to the firm (or of the firm's financials). If external financing is costly, then it will imply a positive relationship between investment and cash stock.

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4 $\theta_t = 1$ could also reflect stationarity in the cash constraint. However, it does not change the implications for the main hypothesis of this paper.

5A discussion of the relative merits of Cash Stock (Cash Flow + Marketable Securities + Inventories) versus Cash Flow variables can be found in Love (2003). Cash Stock is less correlated with the "fundamentals" in the model, i.e. with the marginal profitability of capital.

Cash Flow serves in the model as a proxy for future growth opportunities in the absence of external financing because if the firm foresees high investment in the future, it will choose to accumulate liquid assets today (which is costly) (Love (2003)). Therefore, we could parameterize the financing constraint as a linear relationship:

$$\theta_{it} = a_{01} + aCash_{it-1},$$
(6)

where $a_{01}$ represents a firm - specific level of financing constraints (which enters into the fixed effects) and $a$ is the sensitivity of investment to the amount of internal funds available to the firm at time t-1. In this linear representation, the cash flow affects the rate of inter-temporal substitution between today's and tomorrow's investment. If the firm is not liquidity constrained, $\theta_t = 1$, the effective discount factor is therefore given by β and the impact of cash flow on the inter-temporal allocation of investment is zero. The larger the extent of the firm being liquidity constrained, the bigger the impact of the cash flow on the firm's discount factor. Alternatively, an increase in the cash flow increases the effective discount factor and lowers the shadow cost of capital, thus making investment today more attractive than investment tomorrow[6].

Under perfect capital market conditions where firms can borrow and lend freely and will not therefore be financially constrained, we will have $\theta_{it} = 1$, implying that $a = 0$ and $a_{01} = 1$ (i.e., investment is not related to internal funds).

The main argument of this paper is that different types of ownership may change the sensitivity of investment to internal funds (e.g., ownership by a bank or by a financial company may give higher access to external financing acquired through banks or financial intermediaries because of the reduced asymmetric information problem). Thus, $\theta_{it}$ may also be parameterized as depending on the type of ownership:

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[6] Love (2003).

$$\theta_{it} = a_{01} + (a_1 + a_2 OT_i) * Cash_{it-1}, \qquad (7)$$

where the coefficient $a_2$ is expected to be positive or negative for various ownership types. For a subset of firms, instead of the ownership type variable, we also consider ownership concentration (OC) and its effect on the degree of the firm's liquidity constraint.

## 4. Empirical Analysis

### 4.1 The Data

This study uses a 2006 version of the Amadeus Database compiled by Bureau van Dijk which covers all European countries and contains firm-level information on financial performance and ownership for the 2000-2004 period. Amadeus is compiled from various sources but the bulk of the information available has been derived from the official accounts presented by firms at the end of their financial reporting year.[7] The amount of information available in Amadeus varies depending on the size of the enterprise we are observing. Smaller firms are likely to present less data while selecting larger companies will guarantee almost no missing values. Only two restrictions have been applied in selecting firms for the analysis: firms had to have at least 250 employees (this is in line with other studies on the subject) and firms had to be financially active. Applying these restrictions leaves a working sample of 8,637 firms (the number might change in some model specifications according to the different variables characterizing the ownership structure considered) over the five year period 2000-2004 (see Table 1 for a detailed classification of the firms according to their size).

The dataset includes firms based in so called European Russia, that is geographically located West of the Ural mountains. We hence excluded from our analysis all firms located in West Siberia and further East because of a limitation of the standard Amadeus dataset for Europe. However, excluding regions which are heavily dependent on oil (such as the Tyumensk Region and its autonomous part) renders our analysis

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[7] It is worth noting that the regulations regarding financial reporting can vary across the countries covered by Amadeus and hence a degree of error is unavoidable.

immune to biases deriving from anomalous behaviours present in the hydrocarbon sector. However, for those firms which are legally registered in the financial centres such as Moscow, we can still control for the sector-specific fixed effects by including an industry variable (as NACE classification is provided in Amadeus[8]).

A central feature of the Amadeus dataset is that it contains four firm ownership variables. Two variables characterizing the type of shareholders present in the company, the Ultimate Owner Controlling Type (UOCT) and the Shareholder Type (ST), are available. UOCT indicates whether the dominant shareholder of the company is also its ultimate owner. A shareholder is considered an ultimate owner when it owns more than 24.9% of the company with no other single shareholder owning a larger percentage. If such a shareholder is itself a company, for it to be classified as the Ultimate Owner (UO), it must be itself independent.[9] ST is defined as UOCT irrespective of the percentage of shares owned as long as the holding represents a relative majority of shares but less than 24.9%. Overall, there are 11 ownership types.

Furthermore, the data provided by Amadeus allows us to differentiate according to the degree of ownership concentration and independence of the company through the Ultimate Owner Controlling Qualification (UOCQ) and Independence Indicator (II) variables respectively. The minimum qualification level is reached when the ultimate owner does not directly control the company and possesses less than 25% of its total shares. UOCQ further qualifies UOs according to their relationship with each of their subsidiaries. The ultimate owner qualification maximum value is when the UO has a percentage of the shares greater or equal to 98% (this case is labelled as "CR+") having full control of the company. A shareholder is qualified as a Controlling Company ("CR") when it complies with the same qualifications as an UO but its independence indicator is U (i.e. a company with no recorded shareholders or with all shareholders recorded with a "n.a." percentage of ownership). The II indicates the degree of independence of a company with regard to its shareholders (this ranges from "A", meaning that the firm in question is attached to a company

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[8] Although, for taxation purposes, some firms may have reported profits realized in the hydrocarbons sector as profits derived from other commercial activities not directly related to the hydrocarbons sector (World Bank Memorandum 2004). In this case results obtained while controlling for NACE codes might still be biased.
[9] The classification of ownership can be very complex for larger organisations and for multinational corporations. A more detailed description of how Amadeus classifies ownership variables is available from www.bvdep.com.

not owning more than 24.9% of its shares and with 4 to 5 identified shareholders, whose ownership percentage is known, to "C" where 98% of the company's shares are controlled by an individual firm).

Table 2 details the various cases for each of these ownership variables, lists the qualifying criteria for the classifications used by Amadeus and also shows how many observations are present for each subcategory.

**4.2 Empirical Specification**

The model presented in the previous section lends itself to being tested empirically. The main aim of our analysis is to test whether different types of ownership can affect the sensitivity of the firm's investment to internal funds. Throughout, we use the following base equation obtained as an optimal solution of our investment model:

$$\left(\frac{I_{i,t}}{K_{i,t-1}}\right) = \beta_0 + \beta_2(\pi_{i,t-1}) + \beta_3(Cash_{i,t-1}) + \beta_4(Cash_{i,t-1}) * OT_i + \varepsilon_{it}, \qquad (8)$$

where, our dependent variable capturing the rate of investment, $\left(\dfrac{I_{i,t}}{K_{i,t-1}}\right)$, is the change in fixed assets over the fixed assets in the previous year, $(\pi_{i,t-1})$ is the profits at t-1 and allows us to control for the size of firms, $(Cash_{i,t-1})$ is the cash and cash equivalents at t-1 and $(Cash_{i,t-1}) * OT$ is also the cash and cash equivalents at t-1 but interacted with the ownership type variables (namely UOCT, ST, UOCQ and II) presented in the previous subsection. In order to correct for size effects we also standardize all the variables by fixed assets. The estimation procedure adopted in this paper uses cash flow as a proxy for financial constraints taking a stance within the ongoing debate on what researchers should use as valid measures of financial constraints. In particular, we follow certain previous studies (Fazzari, *et al.* 1988; 2000), which have argued that investment to cash-flow sensitivities are higher for firms facing a larger gap between internal and external costs of funding, thereby demonstrating that they are financially constrained. On the other hand, Kaplan and Zingales (1997; 2000) have questioned whether investment-cash flow sensitivities

can actually be used as a meaningful measure of financial constraints since these sensitivities are not necessarily monotonic. Their concerns regarding the Fazzari et al. methodology were later addressed by these authors themselves. This debate has more recently been continued by Almeida et al. (2004), who introduce a new methodology for identifying financially constrained firms, and by Baum et al. (2011), who apply their methodology to a sample of 80,000 firms from around the globe. We do not, however, elaborate further on this issue.

Given the model presented in the previous section of the paper, we expect the coefficient associated with cash and cash equivalents to capture the extent to which a firm is liquidity constrained in planning its investment strategy. A positive coefficient would support the thesis that liquidity constraints are present in the investment decision, while a coefficient of zero (or a negative coefficient) would contradict the theoretical findings. Finally, we expand our baseline model by allowing for the presence of different ownership control variables by interacting them with the cash and cash equivalents owned by the firm. This allows us to assess directly how the type of ownership structure of the company affects its level of liquidity constraint in its investment strategy.

Some variables in the estimation equations may be jointly endogenously determined. For example, firm value and investment may be jointly determined by unobserved productivity or technology shocks. While higher firm value may cause higher investment, it may equally be possible that higher investment increases firm value. Ideally, to account for this problem, one would use the forward-mean differencing (FMD) technique introduced by Holtz-Eakin et al (1988), Arellano and Bond (1991) and Arellano and Bover (1995)[10]. This procedure estimates first-differences for each of the variables, gets rid of firm-specific effects and also uses all possible lags of all the explanatory variables as instruments. The use of a system GMM would be even more appropriate in this context as it is more robust than the Arellano-Bond differenced GMM procedure for cases when the time span of the data is limited (and so is the number of available lagged

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[10]We assume away the possibility of corner solutions to the Euler equation. Aguirregabiria (1997) provides a comprehensive discussion of potential biases induced by the discrete choice problem.

instruments).

However, given that our dataset has only three years of usable data (and hence would not allow for the adoption of the GMM approach), we use panel estimation including both fixed and random effects.

**4.3 Results**

We start our empirical analysis by testing whether the firms are cash constrained as predicted by the theoretical model. First we implement a random effect specification, the results of which are displayed in Table 3. More specifically, Table 3 reports results of the heteroskedasticity-corrected random effects estimation, which includes control variables for the sector and region specific effects, proxied by two digit NACE codes and regional dummies respectively. The predictions obtained in the specifications without the regional dummies and industry dummies (results available upon request from the authors) are found to be robust to the inclusion of such controls.

The first column refers to the baseline model without ownership control variables and confirms the model's hypothesis that firms tend to be cash constrained in their investment decisions. This is consistent with other studies on Russia (see e.g., Aukutsionek and Batyaeva (2000)).

The coefficient attached to the cash flow variable is indeed positive and highly significant at a 99% confidence level. This finding is very robust in both sign and magnitude across all specifications considered. A 10% increase in the share of cash flow to capital is associated with an around 2% increase in investment as a share of capital (evaluated at means). For profits, a 10% increase in profits (as a share of capital) brings about a 0.2% increase in the investment-to-capital ratio (again, evaluated at means). The second column introduces a control variable for the Ultimate Owner (UO) interacted with the cash flow variable. It should be emphasized that the cash flow variable remains positive and significant, confirming, once again, the hypothesis of cash constraints for firms. Again it is worth noting that the cash flow coefficient is robust in

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both sign and magnitude in this specification. Regarding the UO variable, our results suggest that individuals/family-owned and state-owned companies and financial companies and mutual funds (however, for the latter two, we interpret this result with caution due to the small number of such companies in the sample) tend to be less cash constrained than industrial companies at the 95 and 90 percent levels of significance respectively. In fact, for individually-owned companies, liquidity constraints completely disappear. Banks do not appear to be significantly less cash constrained than firms owned by other types of shareholders.

When, on the other hand, we add shareholder type (column 3), the results are again confirmed in sign, magnitude and significance. This seems to suggest that state-owned companies (marginally significant in the equation in column 3) and private individuals/families are less cash constrained and not only when their ownership structure is at the same time more concentrated. This is consistent with the findings by Mickiewicz (2006) that "… corporate control by individuals emerges as a typical outcome of post-privatisation evolution in Russia." Interestingly, the results displayed in the fourth column of Table 3, which relate to the degree of concentration proxied by the UOCR variable, indicate that ownership concentration does not play a significant role in explaining the degree of liquidity constraint (Audretsch and Elston (2002) obtain the same result for the insignificance of ownership concentration when testing liquidity constraints on German firms). Similar results are obtained in terms of the independence indicator as provided by Amadeus. Indeed, results displayed in the fifth column suggest that firms classified as U are less cash constrained. However, it must be remarked that the U classification groups together a variety of cases including the case of omitted information concerning the degree of independence of the company.

Finally, we should note that we also estimated a fixed effect specification. A Hausman test comparing these results with both the specifications (with and without sector and region dummies) suggests that fixed effects are preferred. However, this test does not take into account the reduced time span of the data which only covers three years. Such a narrow time span can strongly bias the process of demeaning over time, which underlies the fixed effect procedure. In other words, results can experience pronounced changes due to the inclusion of additional years to the analysis since these would directly affect the value of the mean as

computed over time. In addition, Baltagi (2008) emphasizes the importance of having a long panel for the usage of the fixed effects. We therefore present the random effects results.

**5. Conclusion**

In Russia firms operate in a context characterised by high capital market imperfections and, as a consequence, the wedge between the cost of internal and external sources of funds is increased. Using sensitivity of investment to cash flow as a proxy for the wedge, we find that in general Russian firms are financially constrained. Our main result, which is robust to many different specifications estimated in this paper, confirms the presence of liquidity constraints in Russia as expressed by the significant sensitivity of their investments to cash flow. This finding is in line with a number of empirical analyses that point to the presence of liquidity constraints in many sectors of the Russian economy (e.g., Perotti and Gelfer (2001), Volchkova (2000)).

Our results on the impact of ownership on the tightness of liquidity constraints are mixed. In particular, we find that individual and family owned and state-owned companies are less cash constrained relative to other ownership structures. The fact that state-owned firms appear to be less cash constrained can be partially explained through the intricate modes of presence of the public sector in hydrocarbons management during the period considered. More surprising is the fact that we do not find evidence of lower cash constraints for banks (in the equation for the UO, bank-owned firms are even found to be more liquidity constrained, which could be reflective of the aftermath of the 1998 crisis in Russia).

We consider at least three possible ways of going forward with our research. First, while at the moment we use a panel data random- and fixed-effects estimation technique, our next step is to increase the time length of the sample to be able to exploit all the benefits of the GMM estimator. This would allow us to include the lagged I/K term (following Love (2003)) in order to account for any possible strong persistence in investment-to-capital ratios over time. Second, following the work of Kaplan and Zingales (1997; 2000) which strongly criticizes the use of cash flow as a proxy for financial constraints, one could select other

variables to interact with the property structure. Finally, provided that our evidence concerning the ownership structure is mixed, one could also consider the possibility of splitting the sample according to average investment-capital ratio and average dividend payments (as for example in Scaramozzino (1997)) to check whether there is a group of mature companies with well known prospects which does not suffer any cash constraints and undertakes its investment decisions purely according to the neoclassical criterion of Tobin's Q.

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**Table 1: Summary statistics on firm size.**

| Employees 2004 | No. Firms |
|---|---|
| 250-500 | 2,842 |
| 501-1,000 | 1,887 |
| 1,001-5,000 | 1,239 |
| 5,001-25,000 | 160 |
| over 25,000 | 12 |
| Missing | 2,497 |
| Total | 8,637 |

**Table 1a. Summary statistics of the main variables.**

| Statistics | Investment$_{(t)}$/ K$_{(t-1)}$ | Cash$_{(t)}$/ K$_{(t-1)}$ | Profits$_{(t)}$/ K$_{(t-1)}$ |
|---|---|---|---|
| Mean | 0.102 | 0.186 | 0.892 |
| Median | 0.037 | 0.028 | 0.323 |
| Std dev. | 0.372 | 0.499 | 21.487 |
| Min | -1.000 | 0.000 | -2266.600 |
| Max | 1.992 | 4.951 | 34.958 |

**Table 2:** Types of owner and control structure of the companies surveyed, including the number of firms in each category.

| UOCT — Ultimate Owner Controlling Type - when an UO* owns > 24.9% of the company with no other single shareholder owning a larger percentage**. | No. Firms | ST Shareholder Type | No. Firms | UOCQ Definition — Ultimate Owner Controlling Qualification | No. Firms | II Definition — Independence Indicator - signifies the degree of independence of a company with regard to its shareholders. | No. Firms |
|---|---|---|---|---|---|---|---|
| Bank | 4 | Bank | 6 | CR — Controlling company with <= 50% of shares or 1% between 50.01% and 97.99% | 198 | A — Attached to company not having more than 24.9% of shares AND with 4 to 5 identified shareholders, whose ownership percentage is known | 113 |
| Employees/Managers | 1 | Employees/Managers | 1 | CR+ — Controlling company with >= 98% of shares | 253 | A+ — As above with >=6 identified shareholders | 3,449 |
| Financial company | 11 | Financial company | 15 | CR- — Controlling company with <= 25% of shares or 1% between 25.01% and 49.99% | 318 | A- — As above with 1 to 3 identified shareholders | 567 |
| Foundation | 2 | Individual(s) or family(ies) | 143 | JO — Jointly owned = 50% | 96 | B — Attached to company having >24.9% but <49.9% of shares AND with 4 to 5 identified shareholders, whose ownership percentage is known | 2 |
| Individual(s) or family(ies) | 70 | Industrial company | 2,168 | LI — listed | 46 | B+ — as above with >=6 identified shareholders | 480 |
| Industrial company | 1,822 | Mutual & Pension fund/Trust/Nominee | 8 | UO — Ultimate Owner <= 50.00% or at least 1% between 50.01% and 97.99% | 128 | B- — as above with 1 to 3 identified shareholders | 130 |
| Mutual & Pension fund/Trust/Nominee | 3 | Other unnamed shareholders | 11 | UO+ — Ultimate Owner >= 98.00% | 728 | C — Attached to company having >49.9% | 14 |
| State, Public authority | 141 | State, Public authority | 53 | UO- — Ultimate Owner <= 25.00% or at least 1% between 25.01% and 49.99% | 287 | C+ — Attached to company having >=98% | 6 |
|  |  | Unnamed private shareholders | 3,899 |  |  | D | 1,453 |
|  |  |  |  |  |  | U — Companies that are not in A, B or C hence unknown degree of independence | 2,423 |
| **total** | **2,054** | **total** | **6,304** | **total** | **2,054** | **total** | **8637** |

**Table 3: Cash and cash equivalent interacted with the type, qualification and concentration of ownership and their effect on investment.**
**Random Effects , Controlling for Regional and Sector Effects**

| | Baseline Model | Ultimate Owner Controlling Type^ | | Shareholder Type^^ | | Ultimate Owner Controlling Qualification | | Independence | |
|---|---|---|---|---|---|---|---|---|---|
| Cash | 0.086 | | 0.108 | | 0.082 | | 0.124 | | 0.093 |
| | (0.01)*** | | (0.021)*** | | (0.016)*** | | (0.053)** | | (0.089)** |
| Profit | 0.001 | | 0.002 | | 0.001 | | 0.002 | | 0.001 |
| | (0.0002)*** | | (0.0006)*** | | (0.000)*** | | (0.001)*** | | (0.000)*** |
| | | Bank | 10.269 | Bank | 0.745 | CR | 0.092 | A | -0.075 |
| | | | (9.27) | | (0.155)*** | | (0.089) | | (0.09) |
| | | Employees/Managers | 8.749 | Employees/Managers | 8.76 | CR+ | 0.013 | A- | -0.068 |
| | | | (5.89) | | (5.876) | | (0.088) | | (0.094) |
| | | Financial company | -0.166* | Financial company | -0.267 | CR | 0.064 | B | -0.686 |
| | | | (0.1) | | (0.462) | | (0.094) | | (0.408) |
| | | Foundation | 4.923* | Individual(s) or family(-ies) | -0.112 | JO | -0.093 | B+ | -0.05 |
| | | | (2.553) | | (0.054)** | | (0.082) | | (0.1) |
| | | Individual(s) or family(ies) | -0.147 | Unnamed private shar., agg. | 0.019 | LI | 0.028 | B- | -0.102 |
| | | | (0.071)** | | (0.024) | | (0.262) | | (0.139) |
| | | Mutual & Pension fund/Trust/Nominee | -2.274 | Mutual & Pension fund/Trust/Nominee | -0.009 | UO | 0.061 | C | 1.8 |
| | | | (0.891)** | | (1.131) | | (0.089) | | (1.9) |
| | | State, Public authority | -0.06 | Other unnamed shar., agg. | 0.2 | UO- | -0.016 | C+ | 0.8 |
| | | | (0.036)* | | (0.241) | | (0.058) | | (1.9) |
| | | | | State, Public authority | -0.05 | | | D | -0.055 |
| | | | | | (0.035) | | | | (0.1) |
| | | | | | | | | U | -0.145 |
| | | | | | | | | | (0.09)* |
| Constant | 0.072 | | 0.043 | | 0.05 | | -0.007 | | 0.046 |
| | (0.016)*** | | (0.032) | | (0.02)*** | | (0.036) | | (0.028) |
| Observations | 16297 | | 4269 | | 12243 | | 5502 | | 21945 |
| Number of id | 6884 | | 1671 | | 4798 | | 1677 | | 6975 |
| R-squared | 0.022 | | 0.037 | | 0.024 | | 0.042 | | 0.038 |

Heteroskedasticity-robust standard errors in parentheses;  * significant at 10%; ** significant at 5%; *** significant at 1%