Economics Education and Research Consortium
Working Paper Series

Does Financial-Industrial Group Membership Affect Fixed Investment?

Evidence from Russia

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Working Paper No 01/03

This project (No 98-261) was supported
by the Economics Education and Research Consortium

Research area: **Enterprises and Product Markets**

JEL Classification: D21, G32

Volchkova N.A. Does Financial-Industrial Group Membership Affect Fixed Investment? Evidence from Russia. — Moscow: EERC, 2001. — pp 1–22.

The current research estimates the accelerator type model of fixed investment using a Russian industrial enterprise dataset for 1996 and 1997. The sample of firms was divided into two subsamples based on the ownership structure data. Unregistered Financial-Industrial Groups and non-group subsets were analyzed in order to compare sensitivities of investment to changes in internal liquidity between these sets of firms. Controlling for size and investment opportunities it was found that in 1996-1997 the firms in unregistered groups invested a larger proportion of their retained earnings relative to the rest of the economy. We interpret this result as a proof of the hypothesis of better contract enforcement in unofficial groups compared to the rest of economy in the situation of lack of external financing of investment.

Acknowledgements. The research was also financed by Ford Foundation. I would like to thank David Brown, Sergei Guriev, Yakov Pappe, Victor Polterovich, Mark Schaffer and the participants of the CEPR/WDI conference in Economics of Transition for useful comments and suggestions.

Keywords: Russia, accelerator model of fixed business investment, investment-cash flow sensitivity, Financial-Industrial Groups.

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1. INTRODUCTION

The development of market relations in Russia gave rise to the establishment of Financial-Industrial Groups (FIGs). In 1997 there were about 80 formal groups and many more informal ones. About 10% of industrial output was produced by registered FIGs. Besides, there were a lot of integrated trading-industrial and industrial entities where not only production and trade but also financial ties existed.

Why did the liberalization of economic life bring about the emergence of these groups? Why did the development of market relations form intra rather than inter-company ties between production and financial firms? Based on the fact that integrated structures like FIGs (structures with production and financial ties) are not an unusual feature of transition in Russia, which also exist in developing and developed countries, it seems reasonable to suggest that their formation and development is part of general regularities of the market economy rather than the peculiarities of Russian development.

The theory of industrial organization provides several fundamental reasons for the development of integrated structures in any kind of economy. First of all, vertical integration where either asset specificity that raises the possibility of economy of scale or monopolistic position of one of the firms could lead to an increase in the efficiency of integrated structure compare to independently operating firms. Horizontal integration allowing an increase in the market power also could be another reason for integration.

Contract theory also suggests an explanation for the advantages of integrated structures in certain circumstances due to superior contract enforcement within these structures.

Tax factors should also be taken into account since either the transfer pricing within the group or budget consolidation could efficiently decrease the tax burden of the group firms.

All these reasons become even stronger in a transition economy. Different kinds of market imperfections due to the absence of many important market institutions force firms to choose intrafirm relations rather than market ties. For example, an inefficient financial system and money market problems lead to emergence of a quasi-money or barter market. As was shown by Guriev and Pospelov (1998) in this case the integration of banks and industrial firms could efficiently decrease transaction costs associated with quasi-money.

There is no uniform opinion among experts about the consequences of FIGs formation for the economy. On one hand there are notions that investment and industrial policy within the group promote economic growth, that the ties between production and financial capital in groups make up a deficiency of some important economic institutions. On the other hand, there are arguments against formation of groups based on the possible decrease of competition and negative impact of groups on economic and legislative reforms. It is likely that both effects exist. All regulations concerning FIGs issued in Russia over the last 5 years try to diminish the negative consequences of the groups formation, mainly by limiting ownership structures that make the monopolization of industries impossible. However, till now the relative importance of positive influence of FIGs on economic growth is not estimated. This is what government policy with respect to groups should be based on.

The goal of this research is the investigation of the influence of industrial firm's membership in Financial-Industrial Group on its investment behavior.

Independently of a particular type of modeling the general theoretical prediction with respect to fixed investment behavior of firms participating in groups is following. Assuming that both internal and external financing is available, a gap between the costs of external and internal funds should be smaller for group firms. This result, which is interpreted as a decline in a firm's investment — change in a firm's net worth sensitivity at a given level of investment opportunities for enterprises belonging to Financial-Industrial Groups, was tested in a number of studies based on Japanese (*e.g.* Hoshi *et al*., 1994) and Korean (*e.g.* Shin *et al.*, 1999) data. Empirical evidence in favor of the hypothesis that firms in the groups are less credit rationing than the rest firms in the economy was found.

Could we expect that the same predictions would be valid for the Russian Financial-Industrial Groups?

The analysis of the 1996–1997 firms' accounting data shows that the volume of external long-term credits was negligible in the economy. This and the existence at that time of the high yield GKO market raises doubts as to the validity of the assumption concerning the availability of external financing for fixed business investment in Russian firms. According to official statistics on aggregate level data about the sources of firms' financing of fixed business investment in 1996 – 1997 only 2.5% was due to bank loans, about 30% was from government and non-budget funds and more than 50% was contributed by internally generated funds.

In this research we show that the validity of the assumption of the availability of both external and internal finance for firms' fixed investment is extremely important for empirical testing of the role of banks in FIGs. Even if banks in Russia play the same role with respect to the firms participating in Financial-Industrial Groups as in the FIGs in other countries, providing better contract enforcement in the group firms compared to the rest of the economy, the empirical evidence in favor of such hypothesis will be opposite depending on whether the external financing is available or not.

Assuming that the only source of finance for investment is the retained earnings of the firms we show that the higher investment-retained earnings sensitivity for firms participating in Financial-Industrial Groups relative to the rest firms in the economy will be the empirical evidence in favor of the hypothesis of better contract enforcement in groups' firms compare to the rest of the economy.

This paper is organized as follows. Section 2 reviews the main conclusions of recent literature on fixed business investments. Section 3 provides main hypotheses and the theoretical framework. Data description and estimation results are in Sections 4 and 5. The last section concludes.

2. LITERATURE REVIEW

Over the last decade, a number of researches concerning fixed business investment were undertaken in different countries. Almost all of them have stressed the importance of proxies for firms' internal finance as explanatory variable for investment activity, especially for firms likely to face information-related capital-market imperfections. One of the suggested explanations for such dependence was the existence of the information asymmetry between borrowers and lenders that cause the gap between the external and internal financing. Theoretically, several reasons could be responsible for this gap. First of all, adverse selection could generate this gap under the assumption of imperfect information about the risks associated with borrower's investment project. Second, the possibility of opportunistic behavior of managers (moral hazard) creates the costs of monitoring of managerial actions and it requires a higher return for external suppliers of funds relative to internally generated funds. In these circumstances, the validity of predictions of neoclassical theory of fixed business investment and namely the results of Modigliani–Miller theorem that the firm's decision about real investment is independent of financial factors such as liquidity or leverage becomes questionable.

Hubbard (1998) in the survey indicates that effects of informational asymmetries on investment both in the adverse selection and moral hazard settings have broadly similar consequences for the cost of funds and investment. He shows that for firms bearing different information costs an increase in net worth independent of the changes in investment opportunity has different effects on investment. In particular, for the firms bearing negligible information costs there should be no such effect, while it should be strong enough for firms facing high information costs. Given this, he suggests that 1) controlling for investment opportunities and information costs, firms with higher changes in net worth will invest more; and 2) controlling for investment opportunities, investment-change in net worth sensitivity will be higher for firms bearing higher information costs.

Different proxies can be used for the information-related costs borne by the firms. If we want to emphasize the information imperfection aspect of firms' performance we can use the following characteristics of firms as a basis for grouping: the firm's age, size, its relationship with industrial groups or financial intermediaries and dividend policy.

Numerous empirical studies using different specifications of the neoclassical investment model and different firm-level panel data sets have rejected the simple models based on the null hypothesis of perfect capital markets even for the most developed countries usually referred to as the countries with Anglo–Saxon type of fund market.

The most popular specification of the neoclassical theory used in these researches was the Q-theory approach suggested by James Tobin (1969). Given special assumptions on production function, the cost of adjusting the capital stock function, competitiveness of product and factor markets and frictionless capital market and assuming that firms maximize their expected values, the following investment specification could be obtained:

$$\left(\frac{I}{K}\right)_{it} = a_i + b(q_{it} - p_t) + \lambda_{it} + \varepsilon_{it}\,, \qquad (1)$$

where i and t denote the firm and time period respectively, K_{it} is the capital stock at the beginning of the period, I_{it} is investment, λ_{it} is exogenous technological shock, ε_{it} is optimization error and $q_{it} - p_t$ is the marginal present discounted value of profits from new fixed investment less the price of investment goods. Under certain assumption, the average Q constructed from financial market data as the ratio of stock market value of a firm to the replacement cost of its capital may be used as a proxy for marginal Q. And again, among these assumptions there is an as-

sumption of the independence of financing and investment decisions that also implies the frictionlessness of capital market. When all of these assumptions hold, it is possible to investigate the following equation on firm-level panel data:

$$\left(\frac{I}{K}\right)_{it} = a_i + bQ_{it} + \lambda_{it} + \varepsilon_{it}\,. \tag{2}$$

However, if in the framework of this model we introduce some friction in the capital market, for instance, information asymmetry, then we immediately get the dependence of firms' investments on the changes in net worth of the firms. Therefore, in this case one can expect that the residuals from the regression (2) would be correlated with the proxy for these changes. Moreover, it seems reasonable to expect that this effect would be stronger for firms that are more likely to face binding financial constraints.

There were these two implications that were investigated in different researches. Using cash flow *CF* as a proxy for the change in net worth Fazzari *et al.* (1988) tested the following equation

$$\left(\frac{I}{K}\right)_{it} = a_i + bQ_{it} + c\left(\frac{CF}{K}\right)_{it} + \varepsilon_{it} \tag{3}$$

on the panel data of more than 400 U.S. manufacturing firms over the period from 1970 to 1984.

The division between firms facing more and less severe financial constraints was made based on the size of firms' dividend payoffs. The authors found that cash flow coefficients c were significantly non-zero for all categories of firms and were significantly higher for the low-dividend-payout firms. Given this, the authors reject the assumption of frictionless capital market and suggest the existence of financial constraints for all investigated firms.

Similar results were obtained in other researches (*e.g.* Blundell *et al.*, 1992; Gilhrist, 1991).

The main problems that were raised regarding the results of these tests by other researches (*e.g.* Kaplan *et al.,* 1997) and the author himself (Hubbard, 1998) are following. First, to what extent Q is a good proxy for firm's underlying investment opportunities in the case of information asymmetry in capital market (even if put aside the problem whether the marginal and average values of Q coincide). Second, to what extent the investment-cash flow sensitivity provides a measure of financial constraints rather than non-value maximizing behavior of managers. Third, to

what extent the a priory classification of firms is free from capturing the risk-related attitudes of firms on capital market.

In order to avoid the problems with Q-values the new approaches based on neoclassical investment model were developed. Using Euler equation corresponding to the expected value maximization problem of the firm and different specifications of adjustment costs function and financial constraints, several tests were undertaken.

In this framework Bond and Meghir (1994) specify the model, which explicitly allows for debt-finance and financial assets, controls for imperfect competition and does not rely on a measure of the shadow value of capital. They investigate the following equation

$$\left(\frac{I}{K}\right)_{it} = a_i + \beta_1\left(\frac{I}{K}\right)_{i,\,t^{-1}} + \beta_2\left(\frac{I}{K}\right)^2_{i,\,t^{-1}} + \beta_3\left(\frac{CF}{K}\right)_{i,\,t^{-1}} + \\ + \beta_4\left(\frac{Y}{K}\right)_{i,\,t^{-1}} + \beta_5\left(\frac{B}{K}\right)_{i,\,t^{-1}} + d_t + \varepsilon_{it}\,, \qquad (4)$$

where time-specific d_t and firm-specific a_i effects are introduced in order to control for variation in user cost of capital, Y stands for net output and B is the borrowed capital. Under the assumption that the firm can raise as much finance, as it desires at a given cost the theory predicts the negative coefficient of the cash flow variable.

The authors test this equation on the sample of 626 quoted U.K. corporations over the period from 1971 to 1986. Their main finding is the significantly positive coefficient at the cash-flow variable when the model is estimated on the full sample of firms while the dynamic relationship between this period investment and its previous rate are broadly consistent with what is expected to hold along the optimal path implied by adjustment-cost model. Moreover, while estimating this equation on the subsample of the firms where the relatively low dividend payout firms were excluded, the authors find that the excess sensitivity of investment to cash flow and other financial variables significantly reduced. The authors interpret their finding as the evidence for existence of liquidity constraints for some firms from the sample.

As was mentioned above the existence of relationships between firms and financial intermediaries specializing in reducing information costs could also decrease the sensitivity of investment to the changes in net worth. Therefore, in the investment-cash flow tests for a given level of investment opportunities we can expect that investment would be more sensitive to cash flow for firms without intermediary relationship. It is this

result that could be implemented while studying the possible reduction of information asymmetry within Financial-Industrial Groups.

And in fact, Hoshi, Kashyap and Scharfstein (1994) confirmed this result in the framework of Q-model for Japanese firms using the membership in *keiretsu* as a basis for firms sorting. Shin and Park (1999) also find the support for this hypothesis based on data for Korean *chaebols.*

Perotti and Gelfer (1998), following the way of investigation of investment processes in Japanese firms also rely on the Q-model of investment. They test it on two different sets of Russian enterprises: group and non-group firms. The authors found that investments in non-group firms are sensitive to changes in internal liquidity of the firms. This hypothesis was rejected for firms participating in groups. Authors interpret this result as an evidence of extensive financial reallocation across group firms and existence of internal capital market, which facilitate the access to finance for good projects by reallocating resources across firms.

Several problems arise with this result. First of all, the modeling of investment within the framework of Tobin Q-model has some essential shortages in its description of the Russian situation. And the most severe shortage seems to be the failure of one of the most important assumptions of this model, namely, the assumption of the effectiveness of stock market. The stock market that existed in Russia over the last few years probably could not be regarded as an effective one due to either information problems of transforming economies or due to myopic expectations of agents in the highly risky environment of the modern Russian economy. Therefore, in these circumstances, we can not assume that there is an efficient secondary market for firms' shares. And thus we could use Q-values estimated on Russian stock market data neither as a proxy for marginal present discounted values of profits from new fixed investment nor as a proxy for constant investment opportunities.

Similar problem could arise if we try to test the dynamic model of investment based on the Euler equation on Russian panel data. This model assumes the arbitrage condition on the secondary stock market that also implies the existence of this market and its efficiency.

Nevertheless, one important issue developed in papers mentioned above could be very useful in our investigation of FIGs' advantages in Russian economy. I mean the a priory separation of two sets of firms, group and non-group firms, and testing the difference in the investment-changes in firms' net worth sensitivities between group and non-group firms.

Since any specification of models mentioned above could not be tested on Russian data, in this research we suppose to model the investment

activity of Russian enterprises in the framework of another model that seems to be more adequate to Russian reality and namely in the framework of accelerator model. Under political and economic uncertainty, it is more natural to assume positive dependence of investment opportunities on changes in production rather than on the expectations of future flow of payments induced by this investment. Moreover, for Russian enterprises, with its lack of credits as one of the reasons of continuing production decline in the country, there are the changes in production that could be regarded as a proxy for the measure of investment opportunities.

Facing the similar problem of obtaining appropriate data for study of investment behavior in transition economy, Anderson and Kegels (1997), Lizal and Svejnar (1997) also rely on the accelerator model of investment demand in their investigations of investments in Czech industry.

3. ESTIMATION FRAMEWORK

For our test, one of the basic challenges is the choice of the appropriate investment model. In this research we investigate the accelerator model of investment adjusted for cash flow .

3.1. Demand side of fixed business investment

Under standard assumptions of the accelerator model of fixed investment the derived demand for gross investment is of the following form (*e.g.*, Clark, 1979):

$$I = \sum_{s=0}^{\infty} \beta_s (\Delta Y_{-s}) + dK_{-1}. \qquad (5)$$

The intuition behind this equation is rather simple: as long as a firm's output increases the firm finds reasonable to acquire new fixed assets in order to meet the increasing production needs, and in the case of declining sales a firm sells the useless assets. In both cases the term dK_{-1} captures the depreciation expenses.

3.2. Supply of funds for investments in fixed assets

Assuming that the measure of the change in net worth available for many firms is the cash flow variable (that is, retained earnings equal to the

sum of earnings and depreciation allowances) it can be used as a proxy for the change. Moreover, given that there is a lag between the moment of making an investment decision and its implementation we could expect that not only current changes in net worth could matter but also the lagged ones.

Therefore, we can get the empirical specification of the accelerator-cash flow model

$$\frac{I}{K_{-1}} = \alpha + \sum_{s=0}^{N} \beta_s \frac{\Delta Y_{-s}}{K_{-1}} + \sum_{s=0}^{N} \delta_s \frac{CF_{-s}}{K_{-1}} + u \,, \tag{6}$$

where I stands for firm investment in fixed assets over the period, K_{-1} is fixed assets in the beginning of the period, ΔY is changes of production relative to previous period and CF is real cash flow of the firm over the period that we use as a proxy for the volume of internal funds available for investment. Fixed assets at the beginning of the period undo consideration are used as a proxy for the size of the firm to scale all variables in order to avoid heteroscedasticity problems.

At the next stage we are constructing a proxy for the information-related costs borne by the firms. We can do it, for example, by a priori grouping of the firms under consideration according to the relevant parameters following which we will test the hypothesis that the investment-cash-flow sensitivity is different for different groups of firms. As suggested by Hubbard (1998) one of the most direct measure of information costs could be a relationship of the firms with financial intermediaries. Therefore, we can use the fact of participation of the firms in Financial-Industrial Groups as a proxy for the severity of the problem of information asymmetry faced by the firms. If controlling for investment opportunity we get the result that the firms participating in FIGs invest a lower fraction of each incremental dollar of internal funds relative to firms that do not participate in FIGs then we can conclude that the ties of firms with financial intermediaries decrease information costs.

It was this result that was supported by empirical evidence in the case of Japanese 'keiretsus' and Korean 'chaebols' (*e.g.,* Hoshi *et al.*, 1994; Shin *et al.*, 1999). Could we expect that the same result would be obtained in the case of Russian Financial-Industrial Groups? First of all, it is worth stressing that one of the main assumptions that has led to the above conclusions is the availability of external finance for firms' fixed investment. The expected difference in investment-cash flow sensitivities of different sets of firms is interpreted as a consequence of the different level of gaps between the cost of internal and external financing faced

by these sets of firms. The case of the Russian economy of 1996 – 1997 was quite different in this sense. The presence of the high-yield GKO market, underdeveloped financial market and the banking system as well as insufficient focus on the problems of corporate governance led to a severe outflow of the sources of external finance from the real economy. Neither the stock market nor the banking system provided the firms with investment funds. Besides a very small volume of government credits intended mainly for a small number of large enterprises, the only source of funds available for fixed business investment was firms' retained earnings. Therefore, we can not expect that negligible input of banks loans could lead to decline in investment-cash flow sensitivity for the subset of FIG's firms relative to the rest in economy. What pattern of investment-cash flow sensitivity should we expect in this case?

3.2.1. FIG's effect. Let us consider two economies, the first one with developed banking system that provides enterprises with credits for investment purposes, and the other where the only source of finance is the firms' internal funds. In both economies there are independent firms and firms participating in Financial-Industrial Groups. We want to compare the difference in investment-cash flow sensitivities between two samples of firms in these economies.

Let us consider two firms with similar investment opportunities. We will assume that one of the firms participates in a Financial-Industrial Group, that is there is a bank that exercises a thorough control both over the firm's bank accounts and the managerial actions, and the cost of this monitoring is equal to zero due to special relations among the group members. The second firm is independent one and we will assume that the contract between the owner of the firm and its manager is not complete, the owner of the firm cannot exercise costless control over the firm's bank accounts and the managerial actions, due to which the manager has discretion over the cash flow.

As long as we consider economy with external sources of finance, we will assume that the interest rate on banks' credits is an increasing function of the volume of credit due to the fact that a larger volume of credit implies a larger number of deals and payments, which provides an incentive for manager or owner to act against the interests of the creditor. Obviously, the slope of this function will be the larger, the larger is the bank's monitoring expenses. In this case the participation of the firm in FIG will lead to the decline in bank's monitoring expenses and therefore, controlling the investment demand we will get the result that investment-cash flow sensitivity will be lower for the sample of firms participating in Financial-Industrial Groups.

Now let us consider the second economy. As the only source of finance to cover investment expenses is internally generated funds, therefore as long as the cash flow will be lower than the investment demand, then the firm will invest the total amount of available internal funds and investments will decline proportionally to a decline in the cash flow. Since the manager of the independent firm has discretion over the cash flow and can misappropriate some share of it while the manager of group firm is subject to costless thorough control, then, given the same investment demand the group firm will invest the larger proportion of its cash flow compared to the independent firm. Thus, we can expect that comparing two sets of firms, participating and not participating in FIGs, and controlling for investment opportunities the investment-cash flow sensitivity will be larger for the set of FIGs' firms as long as the external financing of investment is unavailable to firms.

To sum up, we can see that the conclusions with respect to the comparison of investment-cash flow sensitivities of independent firms and firms participating in FIGs will essentially depend on the assumption concerning the availability of external finance.

The reason for the importance of such assumption is as following. Given the availability of external finance, better contract enforcement in firms participating in groups relative to the independently operating firms increases investment volumes and does not increase the slope of investment-cash flow dependence, since it is a different effect that prevails here, namely a decline in the asymmetry of information between borrowers and lenders within Financial-Industrial Groups relative to the rest of the economy.

However, as long as the external financing is unavailable for firms' fixed investment, the effect of a decrease in informational asymmetry in Groups disappears and the main role is played by the effect of a better ability of the bank to monitor the managerial actions. Better contract enforcement in group firms results in an increase in volumes invested by their firms and an increase in investment-cash flow sensitivity within this set of firms relative to the rest of the economy.

3.2.2. Firm's size effect. A firm's size is another criteria for grouping. Why could the size matter? Calomiris and Hubbard (1998) suggest that the heterogeneity could arise in the case of debt-financed investments due to a number of factors. First of all, small and medium-sized firms have less access to impersonal centralized debt markets and bank loans because these typical sources of finance require that firms have either certain minimum levels of working capital or certain financial operating

ratios. Second, over the periods when the total amount of finance for credits in the economy is limited there would be small and medium-sized borrower firms that would be denied credits in favor of larger firms. Both of these factors are valid in the Russian case. According to experts' estimates the total amount of funds that could be attracted by all Russian banks could not cover even half of investment demand in the economy. In this circumstances it seems reasonable to use the size of a firm as a criterion for information costs-related grouping.

Given this, we could expect that large Russian firms will be relatively less financially constrained than small and medium-sized ones. Therefore we can test the hypothesis that investment-cash flow sensitivity is lower in the set of large firms versus that of small and medium-sized firms.

Now we can integrate both cases discussed above and consider an economy where a small volume of external financing is available but the primary source of investment funds is firms' retained earnings. Controlling for the size effect, we will test the specification (6) of the model for sets of firms grouped according to the criterion of a firm's participation in Russian unregistered Financial-Industrial Groups.

Given the data for two consecutive years we will test the following regression equation

$$\frac{I}{K_{-1}} = \alpha + \sum_{j=0,-1} \left\{ \beta_j \frac{\Delta Y_j}{K_{-1}} + \delta_j \frac{CF_j}{K_{-1}} + \sum_{k \in \{\text{medium, large}\}} \gamma_{jk} D_k \frac{CF_j}{K_{-1}} + \right.$$

$$\left. + \sum_{i \in \{\text{small, medium, large}\}} \mu_{ji} D_i D_{\text{unreg. gr.}} \frac{CF_j}{K_{-1}} \right\} + \varepsilon, \qquad (7)$$

where D_{small}, D_{medium}, D_{large} are dummies for the set of small, medium-sized and large firms respectively, $D_{\text{unreg. gr.}}$ stands for the dummy for unregistered group subset of firms.

We will test the hypothesis that the coefficients of the interaction terms of the dummy for the large firm subset with scaled cash flows, $\gamma_{j,\,\text{large}}$ $(j = 0, -1)$, are negative. If we obtain empirical evidence in favor of this hypothesis then, given our assumptions, it will indicate that large firms actually have an access to external financing. We are interested in the slope coefficients μ_{ji} $(j = 0, -1;\ i \in \{\text{small, medium, large}\})$, which show the difference in the sensitivity of investment to internally generated funds between the independent and FIG firms. Based on above

assumptions, we expect that these coefficients will be significant and positive.

If we get empirical evidence in favor of our hypotheses we can suggest that the firms in the Russian economy in 1996 – 1997 had very little access to credits and any other forms of external finance, and that the participation of firms in bank-led groups did lead to an increase in investment caused by an effective decrease in the costs of agency problem due to the better monitoring ability of banks that head such groups.

4. DATA DESCRIPTION

We use individual firms' accounting data for 1996 and 1997 from the *GNOZIS* database which is compiled by the *ECAM* information and analysis center. The original balance sheets and financial statements of more than 25,000 Russian industrial enterprises compiled by *GOSKOMSTAT* are presented in this database. However, the original gross investment flows are available for a fraction of the firms. The volume of fixed business investment is measured as a volume of fixed assets installed by the firm over the year. The value of capital stock is measured as the stock of fixed assets at the beginning of the period, cash flow is measured as the revenues minus expenses minus change in inventories minus change in accounts receivable plus change in accounts payable over the period plus depreciation allowances. In order to get real changes in firms' performance, 5-digit industries' producer price indexes were used.

In order to test the hypothesis that the participation of a firm in Russian Financial-Industrial Groups reduces the costs of agency problem borne by a firm we compile two lists of Russian firms. The firms that were listed in the Financial-Industrial Groups Registry Book for 1997 were classified as the registered group firms. We used several criteria to identify the unregistered group firms. First, we relied on information about the firms' ownership structure that was available from Skate Kapital Press. The firms where the largest Russian banks (*Menatep, Uneximbank, Inkombank etc*.), large oil companies (*Yukos, Sidanko*), large trade companies (*Roscontract*) or foreign investors were major shareholders were classified as the unregistered group firms. The reviews of the largest bank-led groups (*e.g*., Bunin *et al.*, 1998) was used for these purposes. Firms related to groups such as *Unified Energy Systems of Russia, Gazprom, Svyazinvest* and similar ones were also treated as the unregistered group firms. Several industry-led groups (*Energomashcorporaciya, Severstal' etc*.) were also included in the list of unregistered groups.

Based on these approach, we compiled a list of 650 enterprises participating in unregistered groups and a list of 590 firms participating in registered groups. We treat the firms that do not appear in these two lists as independent firms.

Due to the incompleteness of the database, the number of firms deemed to be unregistered groups' firms is 105 in the regressions, the number of firms regarded as registered groups' firms is 19 (this is why we exclude firms participated in registered FIGs from regressions), and the number of independent firms is 140. Thus, we should emphasize that we should not overestimate the results that we obtained in this research because the sample under investigation was incomplete.

Table 1. Sample by FIG's participation: summary statistics.

Indicators, scaled by Capital Stock 1997		Total sample N_{obs}=258	Independent firms N_{obs}=135	Firms from registered FIGs N_{obs}=19	Firms from unofficial FIGs N_{obs}=104
Investment, 1997	mean	0.12	0.13	0.07	0.12
	std. div.	(0.15)	(0.18)	(0.09)	(0.11)
	median	0.07	0.06	0.04	0.08
Changes in sales, 1997–1996	mean	−0.009	0.02	−0.05	−0.04
	std. div.	(0.36)	(0.37)	(0.23)	(0.36)
	median	0.003	0.005	−0.03	0.003
Changes in sales, 1996–1995	mean	−0.04	−0.001	−0.11	−0.08
	std. div.	(0.47)	(0.53)	(0.55)	(0.32)
	median	−0.01	0.002	−0.06	−0.02
Cash flow, 1997	mean	0.18	0.19	0.30	0.16
	std. div.	(0.26)	(0.30)	(0.28)	(0.19)
	median	0.11	0.11	0.21	0.10
Cash flow, 1996	mean	0.16	0.18	0.24	0.13
	std. div.	(0.22)	(0.28)	(0.16)	(0.14)
	median	0.11	0.12	0.23	0.10

5. EMPIRICAL RESULTS

Since we had firm level data for 1996 and 1997, we were able to estimate the accelerator type investment model for 1997 using two lags of sales changes. After each ordinary least square procedure we performed the Cook–Weisberg test for heteroscedasticity and if the null hypothesis of constant variance was rejected at the 5% level of significance we used the Huber/White/sandwich procedure of variance estimation.

The estimation of equation (7) gives the following result (column 1).

Table 2. Investment equation.

Variables scaled by K_{97}	(1) $Investment_{97}$	(2) $Investment_{97}$
Change in Y_{97}	−0.001 (0.026)	
$Cash\ Flow_{97}$	−0.102 (0.088)	
$Cash\ Flow_{97} \times D_{small} \times D_{unreg\ fig}$	0.057 (0.099)	
$Cash\ Flow_{97} \times D_{medium}$	0.214 (0.167)	
$Cash\ Flow_{97} \times D_{medium} \times D_{unreg\ fig}$	−0.378 (0.260)	
$Cash\ Flow_{97} \times D_{large}$	0.152 (0.098)	
$Cash\ Flow_{97} \times D_{large} \times D_{unreg\ fig}$	−0.115 (0.102)	
Change in Y_{96}	0.095* (0.040)	0.088* (0.036)
$Cash\ Flow_{96}$	0.184* (0.092)	0.102* (0.042)
$Cash\ Flow_{96} \times D_{small} \times D_{unreg\ fig}$	−0.044 (0.136)	−0.014 (0.073)
$Cash\ Flow_{96} \times D_{medium}$	−0.169 (0.124)	−0.022 (0.064)
$Cash\ Flow_{96} \times D_{medium} \times D_{unreg\ fig}$	0.640* (0.262)	0.375* (0.188)
$Cash\ Flow_{96} \times D_{large}$	−0.430** (0.141)	−0.279** (0.098)
$Cash\ Flow_{96} \times D_{large} \times D_{unreg\ fig}$	0.371** (0.140)	0.248** (0.092)
Constant	0.110** (0.015)	0.108** (0.014)
Observations	236	236
R-squared	0.15	0.14

Robust standard errors in parentheses;
* significant at 5% level;
** significant at 1% level.

We see that investment in fixed assets depends significantly on the lagged changes in sales and lagged cash flows and does not depend on current changes in sales and cash flows. This result could be easily explained by the timing of the investment process. If some time is needed to implement an investment decision then we could expect that there are previous year indicators of firm's performance that influence this year level of installed fixed assets. According to Wald test we can not reject the hypothesis of joint insignificance of current variables at 95% level of confidence that allows us to estimate equation (7) using only lagged values of exogenous variables (column 2). Based on this result we can suggest that the positive relation between investments and past changes in sales implies the accelerator mechanism for investment demand in Russian firms. The positive and statistically significant coefficient of the lagged cash flows is consistent with our expectations that the investment of a Russian firm depends on its internal source of funds.

Wald test allows to reject the null hypothesis of joint insignificance of coefficients at lagged cash flows multiplied by size dummies and FIG's dummy at 99% level of confidence. The same result holds for the hypothesis of joint insignificance of coefficients at all interaction terms. Therefore, we interpret the results in the following way.

We see that, controlling for investment opportunities, a change in lagged internal funds leads to a similar change in investment of small and medium-sized firms. Within the group of small firms the affiliation of a firm with an unofficial FIG does not affect its investment-cash flow sensitivity. This means that the participation of small firms in FIGs does not affect the proportion of internal funds spent on investment. It also means that our assumption that banks reduce the costs associated with the agency problem is not valid for small firms participating in FIGs. However, we should bear in mind that the small firms fall into the set of unofficial group firms mainly due to their special position with respect to some larger firm from such groups. Mostly, they are either subsidiaries or firms playing a secondary role with respect to a larger enterprise from the subset. Therefore, we could expect that the banks heading the groups do not focus special attention on their management.

Overall, large firms are less liquidity constrained because the investment-cash-flow slope is significantly lower for this group of firms. This result supports the assumption that the small volume of external credits available to the real sector of the Russian economy in 1996–1997 was mainly accessible for large firms, *i.e.*, small and medium-sized firms were denied credits in favor of larger firms.

The remarkable result is that the large and medium-sized firms from unofficial groups show a significantly different relationship between the in-

vestments and cash flows than independent firms of the same size. The coefficients of the corresponding interaction terms have the expected positive signs, implying that for a certain level of investment opportunities and similar availability of external financing the large and medium-sized firms from unofficial groups invest in fixed assets a larger proportion of their internal funds than independent firms.

6. CONCLUSION

Based on the empirical results we can conclude that the accelerator-adjusted for cash-flow model of fixed business investment works well when is applied to the Russian firms' investment behavior in 1997 – 1996. This result along with the results obtained for Check firms by Lizal and Svejnar (1997) points out the workability of accelerator model framework while analyzing the firm-level investment behavior in transition economies where the inefficiency of stock markets does not allow to use their signals as parameters for investment decisions.

We can argue that the financial system that existed in 1996 – 1997 in Russia did not provide external finance to the majority of enterprises. Only the largest enterprises had access to credits the volume of which was pretty low.

We find that the large and medium-sized firms from unregistered Russian Financial-Industrial Groups with the same investment opportunities as the other firms of the same size invested a larger proportion of their retained earnings. We interpret this result as evidence in favor of the hypothesis that banks in such groups, being able to costlessly monitor the financial flows of firms in the groups, exercise systematic control over the managerial actions. This efficiently reduces the managerial discretion over the retained earnings, which results in the implementation of the larger number of investment projects compared to the independent firms of the same size and the same prospective.

Our results indicate the different role of banks in Russian FIGs relative to the banks in Japanese and Korean groups. Namely, banks in Russian groups do not relax information asymmetry problem for groups' firms. However, our results are sustainable with the hypothesis that banks in Russian FIGs could help to solve the problem of contract enforcement in firms participating in groups. In the economy with inefficient banking and financial systems it means the increase in the volumes of investments implemented by groups' firms relative to independent firms facing the same investment opportunities. These facts emphasize the importance of integrated structures in the economy where both insufficiency of investments and bad corporate governance are substantial impediments for structural and political reforms.

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