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Performance of Business Groups: Evidence from Post-Crisis Russia

Andrei Shumilov

Abstract

Transition economies like Russia lack properly functioning financial markets and institutions, which results in severe agency and information problems. Business groups in such markets have the potential to offer benefits to member firms, but they also may destroy value. Using a unique database on membership in Russian business groups, we analyze the relationship between group affiliation and firm performance on the basis of a large panel of manufacturing firms for the period 1999-2002. We find that group membership has a positive effect on productive efficiency, but gains from improved productivity in group affiliates do not adequately translate into higher profitability. This is consistent with the expropriation hypothesis, according to which controlling owners of groups extract private benefits by siphoning profits from their members. Among the different group categories delineated by type of controlling owner, the extent of profit dissipation is especially large in groups controlled by private domestic owners, who face a greater risk of possible future expropriation of property. Finally, we examine two potential sources of benefits of membership in business groups: mutual insurance among affiliated firms and preferential treatment from the state via subsidies and tolerated tax arrears. We find that, during the period studied, groups neither provided mutual insurance nor did they receive larger support from the state than unaffiliated firms. Together with findings from the previous literature indicating that, prior to the 1998 financial crisis, group firms benefited from more efficient allocation of capital within groups than in the rest of the economy but not after the crisis, our results suggest that the advantages of group membership recede as the economic and institutional environment gradually improves.

Keywords: business groups, firm performance, transition economy, Russia
JEL classification: G30, L20

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1. Introduction

Business groups of various kinds and organizational structures are a prominent feature of the landscape of most emerging markets and of some developed economies as well, where they often control a substantial part of a country's productive assets (Khanna and Ghemawat (1998), Khanna and Yafeh (2007)). Given their ubiquity, diversified groups and the role of group affiliation have been the subject of much analytical analysis and empirical investigation. Among the range of research topics, two focal questions emerge in the literature on groups: How does business group affiliation affect firm valuation and performance? If there are significant effects, what are the sources of the costs or benefits?

In the context of developed economies (such as US and UK), there is wide agreement among empirical economists that membership in diversified conglomerates typically destroys value (Lang and Stulz (1994), Berger and Ofek (1995)). The findings of underperformance or 'discount' of diversified firms are consistent with the theoretical argument that diversification can be harmful because of multi-layered agency problems between shareholders and managers (Rajan et al (2000), Scharfstein and Stein (2000)), which results in inefficient allocation of resources across the firm's divisions through internal capital markets.

In sharp contrast, many studies of groups in emerging markets reveal that group members do better than unaffiliated firms in terms of economic performance. This body of evidence, for instance, includes Chang and Choi (1988) for Korea; Keister (1998) for China; Khanna and Palepu (1999, 2000) for Chile and India; and Khanna and Rivkin (1999) for a cross-country sample. One important explanation for the superior performance of group members is based on the observation that many market and economic institutions do not exist or are underdeveloped in emerging economies: capital markets are incomplete and may be plagued with information and other problems, labor markets often lack institutions for training skilled labor, etc. Business groups are better able than other firms to cope with such inadequacies, because their scale and scope enable groups to replicate internally the functions that in mature economies are provided by external intermediary institutions. In line with this view, Khanna and Palepu (1999) find evidence on the positive role of internal capital markets in Chilean groups; Chang and Hong (2000) report that Korean groups run value-enhancing internal product and labor markets; Khanna and Yafeh (2005) find that business groups in Korea, Taiwan and Thailand serve as a risk sharing mechanisms for their member firms. As group owners in many countries have close ties with government officials, the positive performance effect of group affiliation may also relate to a group's ability to gain privileged access to economically valuable government favors (eg tax breaks, state subsidies and contracts). Convincing empirical evidence in support of the 'political connections' hypothesis is provided by Fisman (2001) in his study of Indonesian groups. Another possible factor in the superior performance of group firms is that a group may serve as a means of exercising market power. Despite the plausibility of this argument, rigorous methods to test it are yet to be developed in the literature on groups. There is, however, some anecdotal evidence suggesting that business groups in developing countries are not conduits for cartelization, nor do they facilitate multimarket contacts that would enhance collusion (Khanna and Yafeh (2007)).

Even though group affiliation is potentially value-adding, the benefits of group membership may not be sufficient to offset the costs associated with agency issues. Unlike widely-held conglomerates in the U.S., groups in many developing countries are characterized by concentrated corporate control, often in hands of family holding companies or banks (La Porta et al (1999)). Though concentrated ownership in group firms may control managerial entrenchment and thus mitigate the 'owner-manager' agency problem, this structure can generate strong incentives for controlling shareholders to divert or 'tunnel' resources in their own favor at the expense of minority shareholders (Johnson et al (2000)). Systematic evidence on the expropriation of wealth by controlling owners in group firms is presented by Bertrand et al (2002) in their study of Indian pyramidal groups and by Bae et al (2002), who studied South Korean groups.

Whether affiliation with a business group is, overall, economically beneficial or costly is an open empirical question. Given that both advantages and disadvantages of groups are likely to be especially pronounced in weak institutional environments, Russia provides a natural setting for analyzing the role of business groups. Underdeveloped financial markets, lax law enforcement, and poor protection of property rights are all distinctive features of the Russian transition from centrally planned to market economy. Using a unique database on membership in Russian business groups, in this paper we analyze the relationship between group affiliation and firm performance based on a large panel of manufacturing joint-stock companies for the period 1999-2002. We first make static comparisons of performance between group members and unaffiliated firms using several measures of firm efficiency and profitability. Such a choice

of performance indicators enables us to draw inferences on whether tunneling is a significant phenomenon among Russian business groups. We then try to account for potential endogeneity of group membership, an issue virtually unaddressed in the existing empirical studies on business groups, by analyzing the effect of acquisitions made by groups during the period under consideration on the performance of targeted firms. Finally, we examine two of the aforementioned potential sources of benefits of membership in business groups: mutual insurance (risk-sharing) among affiliated firms and preferential treatment from the state in a form of subsidies and tolerated tax arrears.

The paper proceeds as follows. Section 2 gives a brief overview of prior empirical studies on Russian business groups and explains how our project differs from them. Section 3 describes the data and presents basic statistics on the economic role of groups in Russia. Section 4 examines the relationship between group affiliation and performance. Evidence on state support and intragroup mutual insurance as potential sources of benefits of group membership is provided in Section 5. The last section summarizes empirical results and presents our conclusions.

2. Studies on business groups in Russia

The development of business groups in Russia began when the transition was in progress. The mass voucher privatization, with the declared objective of creating a diverse ownership structure in the economy, actually served as an instrument for consolidation of ownership. Starting in 1993 the process was often accompanied by brash violations of the law. The serious fighting over assets seemed to be over by about 1998 when the heads (oligarchs) of the largest Russian business groups declared that their main concern was for effective governance of acquired assets. Their plans, however, were interrupted by the financial crisis of 1998. The worsening of the liquidity problem, due to ruble devaluation and GKO defaults, brought about a reduction of stock ownership in a number of groups led by commercial banks. This in turn led to a new wave of ownership changes in the Russian economy. Active participation by regional authorities in this redistribution was one of the most remarkable features of this period. At the same time, favorable conditions in the international oil and other raw material markets, starting in 1999, brought significant cash inflows to groups operating in the extraction industries, which helped them to expand into other sectors, such as agriculture, automobiles, and chemicals. While neither the Russian banking system nor the Russian stock market could raise adequate resources to meet the increased needs of business groups to finance their new investment projects, groups eventually began to seek funding from abroad. Another reason for turning to international financial markets was the need of controlling owners of groups to legitimize their wealth, and selling equity stakes to reputable foreign investors seemed to be one of the best possible options to solve the problem. In order to meet the requirements of the international markets for borrowers and equity issuers, many large groups have made substantial changes since 2000 in their organizational structures and mechanisms of intragroup interaction, including the establishment of focused subdivision companies vested with significant autonomy rights within groups, adopting 'good corporate governance' practices in group members, and selling non-core assets[1]. The beginning of the new millennium has also seen a decline in groups' lobbying power (at least at the federal level) as a result of the government campaign to limit big business' political influence, which was an essential part of the new president Putin's agenda to strengthen the presidency vis-à-vis the other institutions and actors in the political system.

Until recently, evidence on performance-effects of group affiliation in Russia was modest. The authors presented either casual comparisons of performance indicators between group and stand-alone enterprises, or cross-section performance regressions based on small samples of firms (eg, Perotti and Gelfer (2001), Volchkova (2001)). The first study investigating the structure and performance of business groups in detail was by Guriev and Rachinsky (2005). They identified the 23 largest private domestic owners (oligarchs) from a set of controlling owners of 1,297 large manufacturing enterprises in 32 industrial sectors in 2003. These largest owners controlled 42 percent of the sample employment and 39 percent of the sample output in 2001, which attested to a very high degree of ownership concentration in Russia. The authors estimated the effect of controlling-owner type on total factor productivity growth in 2002 and found that the oligarchs outperformed other private Russian owners by 8 percent. As to TFP levels in 2002, oligarchs were still as productive as other private domestic owners.

[1] Pappe and Galukhina (2006) even call these changes a 'fundamental shift from diversified business groups to focused companies as a principal subject of the Russian big business'. Its peak phase – years from 2003 to 2005 – is, however, not covered by our data.

Several studies on business groups in Russia investigated whether group members were less financially constrained than stand-alone companies. In other words, these studies indirectly tested whether internal capital markets could be source of performance differences between group and unaffiliated firms.

In the spirit of Fazzari et al (1987), Perotti and Gelfer (2001) estimated investment-cash flow sensitivities for group and non-group firms in 1995. They found that investment is positively related to cash flows for unaffiliated firms and negatively for firms from bank-led groups. The interpretation given was that intra-group capital markets redirect finance to firms with better investment opportunities, albeit the possibility that controlling owners of groups channel resources into private benefits could not be formally rejected either. It is worth noting that the Q model of investment used by the authors was problematic in its application to the Russian economy. First, because of the inefficiency of the Russian stock market in the early phase of transition, market-to-book ratios might not properly reflect firms' investment opportunities. Second, as the number of listed companies was very low, the sample (34 group affiliates; 37 independent firms) was not representative even for the population of large Russian companies.

In an attempt to avoid stock market data problems, Volchkova (2001) tested differences in cash-flow sensitivities between firms from unregistered groups and independent firms in 1996-1997 using the accelerator model of investment instead of the Q model. This made it possible to consider a somewhat broader sample: 104 group firms and 135 stand-alone companies. It was found that investment by group affiliates is more dependent on cash-flows than that by stand-alone firms of similar size. The author proposed the following interpretation. In an economy with virtually no sources of external finance, as long as the cash flow is smaller than the investment demand, the firm will invest the total amount of available internal funds. Since the manager of the independent firm has discretion over the cash flow and can misappropriate some of it, and the manager of a group firm is subject to costless control by the group bank, the group firm, given the same investment demand, will invest a larger proportion of its cash flow than will the independent firm. The paper concluded that, although banks in Russian groups did not alleviate information asymmetry problem for group affiliates, they did help to solve the problem of contract enforcement in group firms.

The approach of using cash flow sensitivity of investment as a measure of financial constraints, used by both Perotti and Gelfer (2001) and Volchkova (2001), has however been questioned both theoretically and empirically in several studies (eg Kaplan and Zingales (1997)). Recently, Almeida et al (2004) proposed a new test of the impact of financial constraints on corporate policies derived from a dynamic theoretical model of a firm's liquidity demand. In the model, the effect of financial constraints is captured by the firm's propensity to save cash out of cash flows (the cash-flow sensitivity of cash). Empirically, a constrained firm should have a positive cash flow sensitivity of cash, whereas an unconstrained firm's cash-flow sensitivity of cash should display no systematic patterns.

To test the hypothesis of easier access to external financing for Russian business groups compared to the rest of the economy, Shumilov and Volchkova (2004) applied the cash-flow sensitivity of cash empirical methodology to a sample of more than 3,000 Russian companies and found that in the period 1999-2002 Russian business group members had statistically the same positive propensity to save cash out of cash flows as that of their independent counterparts. Moreover, cash flows sensitivities of cash did not differ as between bank-led groups and the rest of the groups. These results suggest that access to external financing is constrained for firms affiliated with groups. The authors argued that even if internal capital markets do exist within Russian business groups, their efficiency is rather doubtful. Therefore, potential performance differences between group-affiliated and other firms could hardly be attributed to capital markets within groups in post-crisis Russia.

We conclude this section by explaining the contributions of our study to the existing literature on business groups in Russia. As regards performance comparisons, our project differs from the most relevant paper by Guriev and Rachinsky (2005) in the following ways. First, we use a more appropriate definition for the category of firms under investigation. Whereas Guriev and Rachinsky explored *assets* controlled by the largest Russian owners, we are interested in *groups* of firms under common administrative or financial control. It is clear that these two categories of firms widely overlap but do not coincide. For instance, a very large enterprise[2] controlled by an oligarch who has no other significant assets clearly should not be classified as a 'business group affiliate'. The second difference is that our analysis is based on a comprehensive sample of industrial joint-stock companies, while Guriev and Rachinsky limited their attention to a much smaller set of large firms in selected industrial sectors. Even though they considered both joint-stock and limited liability companies, the coverage of our regression sample is wider by 70

[2] Such as the steel-producing giant Novolipetsk Metallurgy Plant owned by Vladimir Lisin.

percent in terms of employment and 20percent in terms of output. Finally, and perhaps the most importantly, our data on membership in business groups have a panel structure. This allows us to make not only static comparisons between groups and unaffiliated firms but also to explore the dynamic effects of joining business groups. As regards studies on possible reasons behind differences in performance between groups and other firms (Perotti and Gelfer (2001), Volchkova (2001), Shumilov and Volchkova (2004)), these focused solely on the general issue of efficiency of capital markets within groups. Our paper thus presents the first attempt to analyze intragroup risk-sharing and preferential treatment from the state as potential sources of benefits of group affiliation.

3. Data and preliminary observations

3.1 Data

In this study we use annual data on Russian manufacturing joint-stock companies (JSCs) from the Disclosure Program administered by the Federal Commission for the Securities Market (FCSM). According to the Federal Act on JSCs, security issuers are mandated to disclose information on their activities to the FCSM in a form of special reports, which are then placed on websites of the Disclosure Program of the FCSM and its authorized information agencies (AK&M and Interfax). The submitted annual data, in particular, must contain complete financial statements and detailed information on ownership structure, board of directors, management, and number of employees. FCSM reports thus cover a wider range of enterprise characteristics than any existing large database of Russian firms. The program started in 1998, and in 2003 the format of reports changed to PDF files, making automatic data processing effectively impossible. Therefore, our dataset of annual financial statements constructed on the basis of collected reports spans the period 1998-2002. Its earlier version was used in the study on differences in access to external financing between business groups' affiliates and independent firms (Shumilov and Volchkova (2004)). Specifically for the purposes of the current research, it has been substantially updated and thoroughly cleaned (see Appendix A for description of data cleaning procedures). Where possible, we filled gaps in financial and employment data using the Russian Enterprise Registry, a yearly census of large and medium-size firms, maintained by the Russian statistical agency Rosstat. Our working database thus refined contains 19,144 observations for 4,688 manufacturing firms.

The data set on membership in business groups (with exit and entry dates), from the start of transition until 2002, was compiled in several steps from a variety of sources. Note that there is no universal definition of a 'business group' in the relevant literature, because the distinguishing characteristics of groups can vary substantially across institutional contexts[3]. Following Pappe (2000), the term business group means here a collection of legally separate firms that satisfies two conditions. 1) Affiliates interact and coordinate their businesses on a regular basis. 2) There exists a central group entity (bank / company / individual(s)) that makes the key binding decisions for all the affiliates. For greater concreteness, we added the condition that a group must include at least two large enterprises or one large firm and several medium-size companies. Based on this definition and using information provided by Yakov Pappe, the leading expert on big businesses in Russia, we first identified major business groups and their core members. Then, utilizing data on ownership structure from FCSM reports, we added to the group membership lists those companies whose major shareholders were group affiliates identified in the previous stage. Because, in a number of cases, major shareholders were nominees or offshore firms, we also used information about affiliations of the firms' managers and members of the boards of directors. Finally, we tracked articles mentioning firms' entries into or exits from business groups in Russian journals and newspapers during the period under consideration. We ended up with a set of 675 group-affiliated manufacturing firms (at least in one year), whose reports were present in the FCSM database.

Business groups were further divided into three categories by type of ultimate controlling ownership: the state, private domestic owners or foreign owners. In the state groups category, five groups are controlled by the federal government (Gazprom group, RAO UES, Rosneft, Slavneft, and TVEL), and two by regional governments (Bashneftekhim and Tatneft-Nizhnekamskshina). In principle, each government level in a federation can pursue its own political and economic objectives, and thus management styles in firms controlled by different government levels may vary. We, however, decided not to split state groups into subcategories because of the small number firms from regional groups in our database.

[3] A review of various approaches to define business groups can be found eg in Cuervo-Cazurra (2006).

Our second category, private domestic groups, roughly corresponds to 'oligarchic groups' from Guriev and Rachinsky paper (2005), though one should keep in mind the considerable differences in definitions and samples. The last class, foreign groups, is comprised largely of subsidiaries of big multinational corporations (such as BAT, Nestle, Procter & Gamble). The main results of our group identification procedures are summarized in Appendix B, where Table B.1 lists 33 major Russian business groups that were in existence in 2002, with information on their structure: names of subgroups, major industries and biggest manufacturing JSCs, types of controlling owners and names of leading banks.

3.2 Variables

We now turn to definitions of variables required in the analysis of relationship between group affiliation and firm performance.

Performance measures. Empirical measurement of performance in Russia, as in any other transition economy, is subject to transition-specific difficulties. For instance, because during 1998-2002 the Russian stock market was very narrow (with less than 100 publicly listed firms) and highly inefficient, we can hardly rely on equity-based indicators of performance. As there is no consensus on the best single performance measure (see eg Bevan et al (1999) for a discussion of merits and drawbacks of different measures in the transition context), we use several common indicators that can be constructed from accounting data: two measures of efficiency - total factor productivity (TFP) and labor productivity - and two measures of profitability - return on assets (ROA) and return on sales (ROS).

TFP for firm *i* is calculated as a residual from estimation of a log-linear Cobb–Douglas production function for the three-digit industry *j* in year *t*:

$$\log(Y_{ijt}) = \gamma_{it} + \alpha_{it} \log(K_{ijt}) + \beta_{it} \log(L_{ijt}) + \varepsilon_{ijt},$$

where Y_{ijt} is net sales, K_{ijt} is average fixed assets for the year, and L_{ijt} is the yearly average number of employees. To make data comparable across years, we deflate sales and capital (as well as other relevant nominal variables) using annual producer price indices published by Rosstat for four-digit industries. Theoretically, TFP is the best measure of enterprise efficiency, but in transition economies it often suffers from the problem of inaccurate measurement of capital stock (revaluations of fixed assets, imperfect deflators). Therefore, for comparative purposes, we also consider labor productivity as an alternative efficiency measure. We define it as ratio of sales net of VAT and excises to the yearly average number of employees. ROA is calculated as operating profit divided by average total assets for the year, and return on sales is the ratio of operating profit to net sales.

Group affiliation and ownership categories. These will be the main explanatory variables in our study. To distinguish between group members and other companies (also hereafter called stand-alones or independent firms), we introduce the dummy GROUP, which is equal to 1 if a firm is affiliated with some business group in a particular year and zero otherwise. Dummies STATE GROUP, FOREIGN GROUP and PRIVATE GROUP, defined similarly, represent affiliation with groups controlled by the state, foreign and private domestic owners, respectively. Since it is natural to compare performance of group and non-group firms of the same ownership category, we also introduce three indicator variables, STATE, FOREIGN and PRIVATE, for different categories of unaffiliated firms, as follows. A non-group firm is classified as state (foreign)-owned, if the state (foreign investor[4]) is the largest shareholder with holdings exceeding the blocking threshold of 25 percent of voting shares. The rest of the stand-alones are referred to as domestically-owned firms.

Control variables. In order to isolate and measure the performance-effect of group affiliation, it is necessary to control for other factors that could impact firm performance. An important parameter here is firm size, as large firms may benefit from economies of scale and may have better access to financial resources. Moreover, large firms are much more efficient than smaller ones in lobbying their interests in the government (eg to receive state contracts). Therefore, size is likely to be positively correlated with performance. In the regressions, we proxy firm size by the natural logarithm of average employment for the initial year in the sample.

[4] It is well-known that many of the shareholders residing abroad, especially in offshore zones like Cyprus or Gibraltar, are actually controlled by Russian owners. To avoid mismeasurement of our foreign ownership category, we carefully checked the national affiliations of foreign shareholders' owners, using information from the Russian business press. Firms whose owners were revealed to be domestic were not treated as foreign investors.

Performance may also depend on the firm's stage of the life-cycle. Industrial organization theory suggests that mature firms are more experienced, enjoy the benefits of learning, and have a first-mover advantage over firms in the early stage. They may thus enjoy superior performance. At the same time, there could be an offsetting effect: young firms may be more open to new technology as well as more flexible in terms of style and effectiveness of managerial governance. In contrast, firms in the declining stage are usually characterized by inferior performance compared to other firms. We will account for differences in life-cycle stage by introducing two dummies: the first for firms registered in 1998 or later and the second for firms that stopped submitting reports to the FCSM between 1999 and 2002[5].

Next, performance can be expected to vary systematically across industries because of differences in degree of competition, technology, etc. Such factors are captured by 27 industry dummy variables based on the three-digit level of Russian industry classification OKONKh. Lastly, to control for province specifics (eg wage and price levels), we utilize dummies for the seven federal districts and Moscow City (as a reference group).

3.3 Sample selection and summary statistics

After constructing the variables for our analysis, the following selection criteria were applied to the original database. First, we eliminated observations with missing values in any financial variable in use and zero-observations for sales or total and fixed assets for the start and end of year. Second, since it is methodologically incorrect to compare very small firms with affiliates of business groups, we excluded observations for firms with less than 100 employees in every year. Another reason for introducing a lower border for employment was to exclude the trading and coordinating companies, which usually have high sales revenue and few employees and only nominally belong to the manufacturing sector. Finally, we dropped firm-years reflecting extremely large jumps in business fundamentals (sales, employment and total assets), typically indicative of drastic reorganizations, mergers or accounting data manipulations. The resulting sample thus restricted contains 15,629 firm-year observations on 3,715 enterprises for the period 1998-2002. The firms in this final sample account respectively for some 40 percent and 53 percent of total employment and total output in the Russian manufacturing sector. Representativeness checks are performed in Appendix C. Our overall conclusion is that the sample fairly represents the universe of large and medium size manufacturing firms in terms of sectors and regions.

Before examining firm characteristics, we provide information on the economic importance of business groups in Russia. About 520 firms in the sample were affiliated with groups (in at least one year) during 1998-2002. Contributions of group companies to sample output and employment are shown in Figure 1. The statistics confirm the conventional view that business groups control a large part of the Russian economy: their share was 50 percent of sample sales and 31 percent of sample employment in 1998, and these grew steadily to 60 and 44 percent in 2002. Among the different categories of groups, private domestic conglomerates account for the biggest share of output and employment (36 and 27 percent, respectively, in 2002), while foreign groups control the smallest shares (3 and 1 percent). Figure 2 presents the shares of group firms in the sample output of different industries in the last year of the sample. One sees that business groups have a strong presence in the largest industrial sectors, especially in energy and natural resources. Private groups dominate the fuel industry (65 percent of total sales), nonferrous metallurgy (60 percent), and account for nearly one-half of total sales in ferrous metallurgy. In domestic-oriented sectors, the dominating role of private groups is especially pronounced in the automotive industry, the largest subsector of machinery and metal working (74 percent of total sales). Turning to state groups' shares, subsidiaries of the state monopoly Unified Energy Systems almost entirely control the electricity sector. Other state groups have significant presence in the fuel and chemical industries (25 and 19 percent of total sales respectively). The last group category, foreigners, accounts for a considerable share of output (28 percent) in just one sector, food processing. The very modest presence of foreign groups in Russian industry compared to other group categories should, however, come as no surprise. As argued in the literature on FDI in Russia (eg Yudaeva et al (2003)), it seems to be a result of both legal and informal restrictions set by the authorities on acquiring and establishing new firms by foreigners in many industrial sectors (eg oil, gas, and strategic materials).

[5] Inspection of the Russian Enterprise Registry has shown that in the years after secession of disclosure reporting these firms were either absent from the RERLD, or had extremely low levels of output and employment. Therefore, we believe that most non-reporters were indeed liquidated or ended their manufacturing activities.

Univariate comparisons of firm attributes are a natural starting point in our analysis of performance differences between group affiliates and stand-alone enterprises. Table 3 presents descriptive statistics on size and performance measures for the whole sample period, 1998-2002. As seen from columns 2 and 3, group affiliates are on average several times larger than non-group firms, irrespective of whether size is measured by sales, employment or fixed or total assets. In terms of performance statistics, group firms have substantially higher average labor productivity (0.94 vs 0.35) and higher return on sales (0.1 vs 0.05), whereas ROA (0.06) and sales growth (0.14) are statistically the same for independent and group companies.

Looking at the breakdown of groups by ownership type, we can see that different business groups are not identical in their characteristics. Firms affiliated with groups controlled by the state are the largest in terms of all measures of size. Compared to the reference sample of independent state firms, they have higher average labor productivity and return on sales, but significantly lower return on assets and sales growth. The latter result should not be surprising, given that we observe huge size discrepancies between state-controlled groups and stand-alones. Members of domestic private groups are much more heterogeneous in size than affiliates with state groups (as indicated by wide differences in means and medians of size indicators), although the average size figures do not differ dramatically across these two categories. Comparison of private groups and private stand-alones reveals the same pattern in performance differences as for the case in which we did not distinguish between group categories: significantly higher labor productivity and ROS in group firms and the same for average ROA and sales growth. Finally, affiliates of groups owned by foreigners are bigger than focused foreign stand-alones in terms of sales and assets, despite their being the smallest of the group firms. Average performance of foreign groups' members is striking: all performance indicators are at least 1.5 times higher than those of the category of foreign independent firms. These differences are particularly notable if we take into account that foreign stand-alones are the most successful category of independent firms, by all performance measures.

The same picture unfolds if we compare different group categories with stand-alones taken as a whole or look at year-by-year summary statistics (not reported to save space). In sum, raw data comparisons suggest systematic differences in performance between independent and group firms. The obvious problem with univariate approach, however, is that group membership may be correlated with variables that have their own direct effects on performance. As we already saw, group firms differ greatly from stand-alones in one of these parameters, firm size. Moreover, independent and group firms are very unevenly distributed across industries. Therefore, descriptive statistics results are likely to be misleading, so that we resort to multivariate analysis.

4. Regression analysis

4.1 Econometric model

To investigate the relationship between firm performance and group membership, we estimate performance equations of the following form:

$$(Performance)_{it} = \alpha + \beta(Group\ and\ ownership\ variables)_{it} + \gamma(Controls)_{it} + \varepsilon_{it}, \textbf{ (1)}$$

where *(Performance)* is one of the selected performance measures, *(Group and ownership variables)* is either the GROUP dummy or a set of dummies for different ownership categories of group and independent firms[6]. Control variables include firm size, dummies for new and dying firms, industry and regional dummies (with 'other manufacturing' and Moscow City as references, respectively).

As group affiliation variables do not vary much over time, we focus on the longer-term relationship between group affiliation and performance and hence estimate the model using the between-effects method (ie least squares regression of individual averages over the period 1999-2002). Apart from comparing performance levels in the basic specification, it is also interesting to look at changes in performance, and so we also consider a model specification in which the value of dependent variable for the initial year in the sample is included as one of covariates.

To mitigate possible undue influence of outliers in subsequent regressions, we winsorize all dependent variables at 1percent and 99percent levels of their distributions. We also control for the fact that our panel is unbalanced (and thus individual averages are calculated on the basis of time series of differ-

[6] Since six categories of groups and unaffiliated firms are mutually exclusive, we omit dummy variable for the biggest subsample of firms, private stand-alones. Choosing another category of independent firms as a benchmark does not affect the significance of the main results.

ent lengths) by year-demeaning all continuous variables in the model. For the same reason, estimation is performed via WLS, where the weighting is based on the number of observations per firm. Additionally, standard errors are corrected for heteroscedasticity using White's method.

4.2 Estimation Results

Table 2 presents the estimates of the performance regressions for the case in which categories of business groups are not distinguished. Before getting to the results related to our main interest, we examine how some conventional firm-specific factors affect our dependent variables. In line with standard theoretical predictions, firm size is significantly positively related to both efficiency and profitability (though for ROA the relationship is somewhat weaker than for other performance measures). Firm life-cycle controls also exhibit the expected relationships with performance. Consistent with the supposition of poor performance in the declining stage, the dummy for firms that stopped reporting is negative and highly significant in all regressions. New firms do not differ significantly from others in terms of efficiency measures, which suggests that the two counteracting effects of openness to new technology and lack of experience at the early stage of the life-cycle offset each other. At the same time, younger firms are shown to have lower profitability, which reflects the initial sunk-costs burden of these firms.

We now look at how the key variable, the GROUP dummy, is related to performance outcomes. In the basic specification for total factor productivity, the coefficient of this dummy is positive and significant at the 1 percent level, suggesting that group affiliates are more productive than stand-alone firms. Specifically, a group member outperforms an independent firm, on average, by 14 percent in TFP. When the initial level of TFP is included in a set of controls (specification 2), the coefficient of the group dummy is again positive and highly significant. Hence, group firms have an advantage over stand-alones, not only in level of TFP but also in the cumulative growth of this indicator (the estimated growth difference is 6 percent).

Regressions for another efficiency indicator, labor productivity, yield qualitatively similar results: group affiliates perform significantly better than stand-alones. Quantitatively, performance differences between these two subsamples of firms are now more pronounced: 54 percent in terms of labor productivity levels and 18 percent in terms of its growth. But, in conjunction with findings from the TFP regressions, this indicates that group firms are substantially less capital productive than stand-alones, which is a strange result. It follows that our capital variable, even after adjustment for inflation, is still likely to be an imperfect proxy for the true value of capital. Hence our decision to introduce labor productivity as an alternative efficiency measure in the study appears to be warranted, and we recommend treating quantitative estimates of TFP regressions with some caution.

The last four columns in the table display the regressions for profitability measures, return on sales and return on assets. As is known from the basics of firm theory, efficiency improvement results in reduced unit costs of production and, ceteris paribus, increased profits. Therefore, as group members have proven to be much more efficient than stand-alones, we would expect significantly higher profitability among group firms. Surprisingly, the regression results show that this is not the case. In the basic specification for the return on sales, the difference between group affiliates and stand-alones is economically small (1 percentage point for a sample standard deviation of 13 points) and statistically insignificant. In terms of ROA, group firms again do as well as the focused independent firms, neither better nor worse. The same conclusion can be drawn by examining specifications of performance equations, which capture the effects of changes in profitability.

How can one explain the apparent puzzle of divergence between efficiency and profitability in group firms? One possibility is that group firms operate in a more competitive environment, so that their efficiency advantage over independent firms does not result in higher profitability. Note, however, that in our performance regressions, we already implicitly controlled for the competition effect by utilizing a set of dummies for 3-digit industries and federal districts. To test further, we introduced a 4-firm concentration ratio at the 4-digit industry level and firm share in the regional (oblast) output as explicit measures of market competition. We found that, contrary to the stated hypothesis, group firms tend to operate in less competitive industries during the observed period: the average concentration ratio for these firms is 20 percent, compared to 14 percent for stand-alones. We then replicated all the performance models with our competition measures included in the set of covariates. This yielded results absolutely identical to those in Table 2, suggesting that market competition issues are hardly related to the puzzle resolution.

In fact, the result that efficiency gains of group firms do not adequately materialize in profitability is fully consistent with the anecdotal evidence on ultimate owners siphoning profits from manufacturing

units of Russian business groups to extract private benefits of control and to evade taxes (see eg Black et al (2000), Fortescue (2006), Desai et al (2007)). The most common technique of profit dissipation during the period under consideration was transfer-pricing in various guises (overstating costs and/or understating revenues), typically implemented as follows. The manufacturing firm sells its output at an unrealistically low price to the trading firm, which is registered in an offshore or onshore tax haven and controlled by the largest shareholders of the first firm. The second firm then sells output products at market prices. The result is that the markup accrues to the trading firm, while the manufacturer loses money and the state and minority shareholders are expropriated[7]. A World Bank (2004) study presented strong evidence that transfer-pricing is especially widespread in the export oriented natural resource sectors - oil, gas and metals - where differences between domestic and export prices of main commodities still exist. To determine whether the behavior of groups in these sectors differs from that in the rest of the industry, in unreported regressions for all performance measures, we excluded oil, gas and metals firms from the sample. In this case, the divergence between efficiency and profitability in group firms virtually disappears. As before, group firms are substantially more efficient than stand-alones, but now they have significantly higher returns on sales. The coefficient of return on assets changes to positive and is only marginally insignificant. These results thus suggest that group owners are most actively engaged in tunneling profits out of controlled firms in the in natural resource sectors of the economy.

Results of regressions with a single dummy for all business groups, though robust[8] and compelling, may conceal some heterogeneity among both group affiliates and stand-alones. Table 3 reports performance regressions where different ownership categories of groups and unaffiliated firms are introduced. As in the previous case, we first examine specifications for efficiency measures of performance. Column 1 shows that, in terms of TFP levels, private groups outperform private stand-alones by 12 percent, and state groups do better than state-owned unaffiliated firms by 22 percent. The efficiency difference between foreign groups and foreign stand-alones is also unsurprisingly positive (6 percent[9]), but insignificant (as indicated by the F-test reported at the bottom of the Table). When initial level of TFP is controlled for (Column 2), differences in cumulative TFP growth between group members and stand-alones within all three ownership categories are positive, but the one within the category of foreign-owned firms again lacks significance. One caveat to these findings is that our capital variable is still likely to suffer from measurement problems, as we noted above. This may lead to hardly predictable biases in estimates of TFP regressions. We therefore suggest viewing outcomes of TFP specifications as only supplementary in drawing inferences about the effects of affiliation with different groups on firm efficiency. It appears to be more appropriate to rely on regression results for a less distorted efficiency measure, labor productivity. Column 3, with the corresponding baseline specification, shows that, similar to the TFP case, productivity differences between groups and stand-alones of the same ownership type are positive, but now they are all strongly significant. The magnitude of group effects is large: labor productivity for members of private, state and foreign groups is 30, 25 and 93 percent[10] higher than for stand-alones of corresponding ownership categories. Over-performance of group firms remains in the specification for cumulative growth of labor productivity (Column 4), except that the estimated growth difference between groups and stand-alones owned by the state is quite small and insignificant. This result suggests that there could be a positive selection in the process of forming state groups. Thus the productivity advantage of state groups over state unaffiliated firms observed in the baseline specification is likely to be somewhat overstated. We will return to the selection issues with respect to group membership in the next subsection.

So far we have analyzed how group affiliation is related to efficiency *within* ownership categories. Interesting observations can also be made on how a firm's performance differs *between* ownership subsamples. Comparison of the results for different ownership types (both across groups and stand-alones) in the baseline efficiency specifications shows that foreign firms substantially outperform private ones, which in turn are more productive than state-owned firms. These findings confirm those of the earlier (often cross-sectional) empirical studies documenting a positive role for private and especially foreign ownership in enhancing enterprise performance in Russia (eg Earle and Estrin (1997), Muraviev (2002),

[7] To a limited extent, transfer-pricing can be separated from the desire to expropriate minority shareholders or to minimize taxation. For instance, a trading firm may be a direct subsidiary of a manufacturing firm, act as a profit center and bear the full tax burden. Although in the Russian context such a possibility seems remote, we cannot reject it formally, because trading firms are not represented in our dataset.

[8] They withstand a number of robustness checks: dropping outliers instead of winsorizing data, excluding firms that stopped reporting and new firms, using alternative sets of industry dummies (two- or four-digit classifications).

[9] exp(0.111)-1=0.12; exp(0.022+0.175)-1=0.22; exp(0.524-0.464)-1=0.06.

[10] exp(0.26)-1=0.3; exp(0.122+0.105)-1=0.25; exp(1.454-0.794)=0.93.

Yudaeva et al (2003)) due to better incentives to monitor managers (Vickers and Yarrow (1990)) and reduced political interference (Boycko et al (1996)). Several recent studies employing adequate techniques to control for endogeneity of ownership (Brown et al (2004), Sabirianova et al (2005)), however, found that better performing assets were transferred from state to private hands in the first place, implying that research based on cross-section data or methodology overstates the benefits of privatization. After accounting for this selection bias, the effect of domestic private ownership on productive efficiency turned out to be negligible, though increasing slowly over time, whereas the foreign-domestic efficiency differential remained large. The latter finding is supported in our additional efficiency specifications: examination of Columns 2 and 4 of Table 3 reveals that foreign ownership is characterized by superior efficiency growth throughout 1999-2002 compared to all other types of owners, while the effect of domestic private ownership is statistically indistinguishable from that of state ownership.

Let us now explore whether groups' efficiency advantage observed within all ownership categories translates into higher profitability. As seen from Columns 5 and 7, this is the case only for foreign groups, which have 9(5) percentage points higher return on sales (return on assets) than foreign stand alones. In contrast, the profitability difference between state groups and state independent firms is small (1 p-pt each for ROS and ROA) and insignificant, while private groups, strikingly, are even less profitable (by 2 p-pts for ROS and by 3 p-pts. for ROA) than private unaffiliated firms[11]. Given that we also find that ordering of ownership categories of independent firms by profitability coincides with that by efficiency (foreign firms are both more efficient and profitable than private ones, which are better performers than state stand-alones), these results suggest that owners and/or managers of private groups tunnel substantial amounts of profits out of group members to extract private benefits of control, affiliates with state groups are also engaged in tunneling, but likely to a smaller degree, whereas profit dissipation in foreign groups seems to be insignificant.

Our results on the 'efficiency-profitability' relationship in different categories of firms are robust to the exclusion of oil, gas and metals firms from the sample. Thus tunneling in members of private and state groups should not be attributed solely to the group-specific behavior in industries where it is relatively easy to use profit dissipation techniques. What then are the reasons behind the differences in the extent of tunneling between owners of our three groups categories? An important rationale for large-scale profit dissipation in private groups is as follows. When building their wealth, most owners of private groups (unlike those of other group categories) stripped assets from state-controlled firms and bought industrial assets in questionable privatization auctions at the lowest possible prices, which immediately posed a problem of illegitimacy of their property rights. To hedge against the risk of possible future expropriation of property by the Russian government, owners of private groups have strong incentives to tunnel funds to safe banking deposits abroad (Braguinsky and Myerson (2007)). Next, a plausible explanation for the existence of tunneling in state groups is that the state does not have a close control over them; and thus their managers are able to appropriate some part of control and cash flow rights for their private benefits. In addition, owners/managers of domestic business groups (both state and private) have superior connections with government officials, which allow them to escape punishment for tax evasion and the abuse of minority shareholders associated with large-scale profit dissipation. Finally, our results on extraction of private benefits in different groups may be partially explained by the differences in degree of ownership concentration: a quick inspection of ownership data shows that foreign groups have nearly 100 percent of votes in most of their members (hence the pie of minority shareholders is small and their expropriation is not an important issue for controlling owners), while equity stakes of private groups are sometimes at levels (eg 51percent) such that large shareholders have strong incentives to expropriate minority owners. These data on group shareholdings, however, still require some adjustment[12], and we leave it as an interesting future project to analyze the effect of group ownership on performance.

The presence of the category of foreign groups, where tunneling is likely to be negligible, allows us to go one important step further than in the case of groups as a whole and obtain rough but informative quantitative estimates of the extent of profit dissipation in private and state groups. Our logic rests on the assumption that, in the absence of tunneling, efficiency gain within the same ownership category should materialize in a profitability advantage in the proportion of 93 percent higher labor productivity to 6 percentage points higher return on sales (exactly as in the case of foreign groups vs foreign stand-alones).

[11] Similar group effects are observed in specifications for changes in profitability (Columns 6 and 8).

[12] One example where correction is needed is related to the fact that Russian antitrust law subjects a purchase of blocks of 20 percent or higher to be disclosed and approved by antitrust authorities. To avoid this, many new controlling owners prefer to obtain several small stakes (often through different nominees) instead of one large stake.

Then, had owners of private and state groups not engaged in tunneling, the estimated efficiency differences between groups and stand-alones within these two ownership categories would translate into 2.7 (2.5) percentage points higher ROS for members of private(state) groups relative to private(state) unaffiliated firms. Taking into account regression estimates of differences in ROS between groups and stand-alones within corresponding ownership categories, we find that tunneling results in a deterioration of ROS of 4.5 percentage points for private groups and 1.3 percentage points for state groups. Given that the mean value of observed ROS in private groups is 0.08 and the standard deviation is 0.18, the scale of tunneling in private groups turns out to be economically large, while in state groups, as expected, it is rather small (as the mean ROS is 0.11 and standard deviation is 0.15). Analogous calculations for another profitability measure, ROA, yield very similar estimates of profitability deterioration due to tunneling: 4 percentage points for members of private groups and 0.5 percentage points for firms from state groups.

4.3. Endogeneity of group membership

One might be tempted to interpret the results of static comparisons between groups and other firms in a causal way, namely, that membership in business groups of all types leads to higher efficiency. This interpretation is, however, subject to the caveat of potential endogeneity of group membership. For example, it might be the case that some unobserved factors cause both performance and group affiliation. Reverse causality explanation of the positive correlation between group affiliation and performance cannot be ruled out either, since it is possible that business groups being good investors acquire better performing firms. Unfortunately, accounting for size, industry and regional specifics in OLS regressions does not fully address these concerns.

Correcting for endogeneity of group affiliation is an example of the general statistical problem of estimating average treatment effects in observational studies where assignment of individuals to treatment and control groups (in our case, group members and stand-alone firms, respectively) is not random. Because of its great practical importance in microeconomic applications, estimation of treatment effects has received much attention in the recent econometric modeling literature, which generated a range of relevant estimation methods (see eg Blundell and Costa Dias (2002) and Wooldridge (2002) for reviews). Different estimators require different (and largely untestable) assumptions for consistency and no one generally dominates the others. Therefore, since the specifics of potential endogeneity of group affiliation are a priori not clear, it is reasonable here to experiment with several methods.

One popular technique for estimating treatment effects (especially in cross-section data cases) is the instrumental variables (IV) approach. It can be very effective if good instruments for treatment are available. These variables should be exogenous in the outcome (performance) equation, correlated with the participation decision, but should not directly affect the potential outcomes from treatment. Unfortunately, we are not able to identify valid instruments in the current study due to data limitations and lack of the theoretical guidance on which parameters might be candidates for instruments – the theory of business groups' formation and dynamic evolution is virtually nonexistent. In fact, such problems with finding appropriate instruments are omnipresent in the empirical literature on business groups. As Khanna and Yafeh (2007) note, no study to date has managed to portray the endogenous formation of business groups using the IV approach.

The availability of longitudinal data enables a researcher to estimate treatment effects without instrumental variables. Specifically, if the treatment impact is assumed to be constant across individuals and over time, and if selection of treatment is independent of temporary individual-specific effects, then consistent estimates can be obtained by estimating equation (1) by the fixed effects method. Note that fixed effects coefficients are only identified from within-firm changes in group affiliation status. Since we have a substantial amount of firms with such changes (138 firms joined and 6 firms exited groups in 1999-2002), use of the fixed effects approach is feasible here.

Panel A of Table 4 gives the results of fixed effects estimations of equation (1) for different performance indicators (labor productivity, ROS and ROA) without distinguishing between group categories. In all regressions, the coefficients of the GROUP dummy are negative, but statistically insignificant, suggesting that joining a business group does not significantly change a firm's performance. One could however hypothesize that performance would improve after a period of restructuring, rather than immediately upon joining a group. To test this hypothesis, we modified our group affiliation dummy so that it is equal to zero in years of group entry. After this transformation, we had 133 'new' group members. Fixed effects analysis (Panel B of the same Table) shows that in the regression for labor productivity the coefficient of the group dummy changes sign to positive, while in profitability regressions it remains negative,

but somewhat closer to zero than in regressions for the untransformed group variable. Though we observe some positive trend in the coefficients of interest, all the results again lack significance. Thus, even when considering group entries with a one year lag, we do not find strong evidence that joining a business group is associated with changes in performance. As an additional robustness check, we considered only those firms that changed their group affiliation status during 2000-2002, and thus reduced our regression sample period to 1999-2002. Results of FE regressions for both transformed and untransformed group dummies remained unchanged.

The very small number of acquisitions by foreign and state groups in the panel (22 and 10, respectively) precludes us from performing FE estimation of equation (1) with a full set of dummies for the different group categories. Instead, we will examine only the effect of acquisitions by private domestic groups (there are 120 such transitions). Results of FE regressions when the dummy for private groups is taken as a group affiliation variable are shown on Panel C of Table 4. As in the case of all group firms considered together, joining private groups has no statistically significant impact on firm productivity. At the same time, in profitability regressions, coefficients of the dummy for private groups are negative and highly significant. Like the results of static comparisons in the previous subsection, these findings of unchanged productivity and worsened profitability are again consistent with the profit dissipation story: soon after acquiring a firm, the owners of a private group engage new affiliates in profit hiding practice. Our results are confirmed when we modify the dummy for private groups or reduce the sample period as described above. Corresponding regressions are not reported, to save space.

As we already mentioned, no one of the treatment effects estimators dominates the others, and the FE approach, in turn, has its own limitations. First, it cannot address event-related selection for business groups. Another potential problem with this method is that fixed effects models often have limited statistical power when variables of interest vary slowly over time.

An alternative method that we use here is the matching approach. One of its main advantages over regression-based estimators is that, being a non-parametric method, matching does not require specifying the functional form of the performance equation and so is not susceptible to bias due to misspecification along that dimension. The aim of matching is to construct the correct sample counterpart for the missing information on the treated outcomes had they not been treated by pairing participants (in the present context, firms that joined business groups during the observed period) with members of non-treated group (firms that remained independent for the whole period). The crucial assumption here is that there exists a set of observed pre-treatment characteristics X such that conditional on X potential outcomes (in our case, performance) are independent of the treatment. This implies that selection for treatment is based solely on observable characteristics. Clearly, this is a strong assumption, and to obtain meaningful results using the matching technique, one needs a rich set of conditioning variables at hand.

When there are several characteristics X in which the treatment and control groups differ, the task of constructing a matched sample becomes virtually impossible (the 'curse of dimensionality'). Rosenbaum and Rubin (1983) proposed a solution to this problem: use 'balancing scores', functions of observed characteristics X such that the conditional distribution of X, given the balancing score, is independent of the treatment. One possible balancing score is the 'propensity score', defined as the probability of assignment to treatment conditional on observed pre-treatment characteristics X.

The matching procedure based on propensity score is performed in two steps. First, the propensity score is estimated using a binary discrete choice model, such as a probit. Then the individuals are matched on the basis of their predicted probabilities of receiving treatment, obtained from the first stage. We utilize the popular nearest-neighbor matching estimator, where each treated firm is matched with the non-treated firm with the closest propensity score. The average treatment effect on the treated is then estimated as the difference between the mean performance of the treated firms and the (weighted) mean performance of firms included in the counterfactual group.

We start by estimating the propensity score using probit. The choice of what variables to include in the probit model is not straightforward. Recall that most Russian business groups are based on strong ownership ties with just a few ultimate owners (Pappe (2000)). And these are generally group authorities who decide whether to acquire a firm, and stand-alone firms cannot join business groups at their own discretion. Therefore, we choose the set of observable pre-acquisition characteristics similar to those used in empirical studies analyzing the relationship between ownership changes and performance with the help of the propensity score matching technique (eg Arnold and Javorcik (2005), Girma and Gorg (2007)): size (capital), labor productivity, profitability (ROS) and debt-to-assets ratio. All these variables are lagged one period. Furthermore, we include a time trend and industry and regional dummies to account for the differences in attractiveness of industries and regions to business groups.

Column 2 of Table 5 reports probit estimates for the case of acquisitions by groups as a whole. The results show that groups tend to acquire firms systematically different from others. As indicated by the positive and significant coefficient of the capital variable, larger firms are more attractive to business groups. Positive coefficients for profitability and labor productivity[13] suggest that groups 'cherry pick' better performing establishments. The last financial variable, debt-to-assets ratio, also turns out to be significantly positively related to the probability of being acquired by a business group. One possible interpretation is that a high debt-to-assets ratio could itself be viewed as an indicator of enterprise success, because Russian firms have on average limited ability to issue debt or obtain bank loans. An alternative explanation is that heavily indebted firms are the easiest targets for takeovers.

The post-probit estimation balancing test indicates that the balancing property of the propensity score is satisfied. Now we can use nearest-neighbor matching to estimate the average treatment effects on the treated for our performance indicators. Corresponding results are reported in Table 6, Panel A. Note that the number of treated firms (94) is higher than the number of untreated matched firms (89), because nearest-neighbor matching is performed with replacement (ie one stand-alone firm could be used as a counterfactual for two or more firms acquired by groups). As the table shows, the estimated impact of joining groups on firm productivity is insignificant both in acquisition year and one year after joining a group. This result coincides with our finding on the relationship between joining groups and productivity based on the FE method. Signs of the effects of group acquisitions on profitability measures are negative, which is again consistent with FE results. Under the matching approach, however, these effects become marginally significant one year after joining a group. This gives some support to the hypothesis that groups (viewed as a whole) deploy transfer pricing or similar techniques to siphon off profits soon after acquiring new members.

Analysis of acquisitions by private groups using propensity score matching (Column 3 of Table 5 and Panel B of Table 6) yields results overall similar to those in the case of acquisitions by groups as a whole: successful firms are picked up; the treatment does not significantly impact productivity and negatively affects profitability. The only difference is that now size and statistical significance of the negative effect of group acquisitions on both profitability measures one year after joining a group are now more pronounced: a 5 percent drop in ROS and 6 percent fall in ROA, as compared to corresponding figures of 3 and 2 percent in the previous case. It follows that, among different owners of business groups, private owners deploy profit dissipation schemes in acquired firms most aggressively.

In sum, the results of our exercises with two different techniques to account for endogeneity of group affiliation (as a whole and affiliation with private groups) are largely consistent with each other. Given that our panel is relatively short and many firms joined groups before the starting year, we should be cautious in drawing inferences about causal effects of membership in business groups. With respect to productivity, we find no statistical evidence on its immediate improvement in firms after joining groups. It is however possible that a substantial amount of time is needed to reveal the benefits of group affiliation, and our sample time span could be too short to observe such productivity improvements. Therefore, whether static estimates of the productivity-effect of group affiliation are significantly biased upward or not remains an open question. The picture is somewhat clearer for the relationship between group affiliation and profitability. We find that groups tend to acquire more profitable firms and that the short-term dynamic effect of group affiliation on profitability is negative. Again, we are reluctant to claim that this necessarily implies a negative causal effect of group affiliation on profitability, as hard evidence can be obtained only by considering *all* transitions into groups. Nevertheless, the plausibility of this hypothesis is supported by the result from our static regressions that true profitability in group firms is hidden by extensive use of profit dissipation techniques.

5. Sources of benefits of group affiliation

In this section we provide some evidence on two potential sources of benefits of group affiliation in Russia: intragroup risk sharing and preferential treatment from the state (in the form of subsidies and toleration of tax arrears), which has received surprisingly little attention in the previous empirical work on the Russian business groups.

[13] Labor productivity lacks significance, which is most likely due to relatively high correlation with other regressors. We also tried an alternative specification of the probit model excluding return on sales. Then labor productivity becomes significant, suggesting that it is indeed an important determinant of entry into a group.

5.1 Risk sharing within groups

One particular function of capital markets that has been associated with business groups is the provision of mutual insurance opportunities for member firms. This idea originated in the literature on Japanese groups, where several studies suggested that groups provide an organizational mechanism through which risks are shared, resulting in smoother measures of operating performance (see eg Nakatani (1984) for empirical evidence). Group members whose profits are low obtain cheap inputs and other forms of group assistance, so that their profitability is not as low as it would otherwise have been. At the same time, group firms whose performance is good share some of their good fortune with less successful group members. A conventional view of the motivation for such a behavior is that employees and managers with firm-specific human capital cannot easily protect themselves against adverse shocks (when capital markets outside of groups are underdeveloped) and so appreciate the risk reduction afforded by intragroup relations (Aoki (1984)).

Following the empirical strategy to test for risk sharing in business groups suggested by Khanna and Yafeh (2005), we will examine whether members of Russian groups have smoother profit rates relative to other firms by estimating the following equation:

$$(VROA)_i = \alpha + \beta(\overline{Group\ and\ ownership\ variables})_i + \gamma_0(\overline{ROA})_i + \gamma_1(\overline{Controls})_i + \varepsilon_i, \quad \textbf{(2)}$$

where *(VROA)* is the standard deviation of the firm's operating profitability[14][15], calculated over 1999-2002, the years for which we have data. *(Group and ownership variables)* stands for either the dummy GROUP or a set of dummies for different ownership categories of group and independent firms (base category – private independent firms), *(ROA)* is the firm's operating profitability, return on assets. Other control variables are similar to those in equation (1). Upper bars denote individual averages over the period under consideration. Since standard deviations of profitability are calculated on the basis of time series of different lengths, equation (2) is estimated using weighted least squares, where we take the number of observations per firm as weights.

Results of our within-group mutual insurance test of are presented in Table 7. When all business groups are included (Column 1), the coefficient of the group dummy is positive, economically negligible (0.004, compared to the mean standard deviation of operating profitability in the sample of 0.075) and insignificant, thus providing no support for the hypothesis of the prevalence of intragroup risk-sharing. After we control for firms' heterogeneity along the ownership dimension (Column 2), not much is changed in the estimates. Again, signs of differences in profit volatility between (foreign, state and private) groups and independent firms of corresponding ownership categories are positive, and all differences are small in magnitude and far from being statistically distinguishable from zero. Finally, when we estimate a variant of equation (2) with the volatility of asset growth rates taken as the dependent variable (results not reported), we find no evidence of smaller volatility for group members. We thus conclude that after the crisis Russian business groups did not follow the pattern of the Japanese keiretsu in providing mutual insurance to member firms, at least not in the form of smoothing operating performance or asset growth rates. Therefore, risk-sharing is unlikely to be a source of benefits of group affiliation in post-crisis Russia. Our finding appears to be in line with the previous more general result of Shumilov and Volchkova (2004), that the role of capital markets in intragroup relations in Russia during the same period, 1999-2002, was at most limited. Note, however, that insignificance of risk-sharing does not make Russian groups a special case, as a similar pattern was observed for groups in most of the large emerging economies at the end of the 20th century (Khanna and Yafeh (2005)).

5.2 Preferential treatment from the state

We now ask the question whether preferential treatment from the state could be one of the sources of benefits of group affiliation. The common direct forms of preferential treatment in the economy are government subsidies, tax breaks and subsidized energy prices (Slinko et al (2005)). Implicit state support via tolerated tax arrears is also documented to be a widespread phenomenon in Russia (Schaffer (1998)). Def-

[14] Summary statistics for profit volatility and other variables introduced below in this section are presented in Appendix D.

[15] Note that some forms of risk sharing could not always be reflected in smoother operating profitability. For instance, internal transfers among group members may enable investment smoothing, which, in some cases, need not lead to smoother profit rates. To explore this possibility, we also estimate a version of equation (2) in which the volatility of asset growth rates is taken as a dependent variable.

initely, some of these favors are non-transparent by nature and cannot be easily measured, but, fortunately, information on valuable components of preferential treatment, subsidies and tax arrears, is present in FCSM reports. We, therefore, investigate whether group firms receive relatively more subsidies from the state or obtain indirect state support through larger tax arrears than non-affiliated firms.

We start by examining the case of subsidies. Data on the flow of subsidies can be found both in Form 3 (equity movement statement) and Form 4 (cash flow statement) of FCSM reports. Form 4 reports monetary subsidies, and Form 3 – total amount of subsidies received over the year (including eg transfers of equipment). The problem with the latter item is, however, that its values are missing in more than 20 percent of observations in our regression sample for 1999-2002. The item 'monetary subsidies', by contrast, has only 346 missing values (out of 12,448), so as our working variable for subsidies we choose that from Form 4[16].

Many firms in the sample did not receive subsidies during the period studied (the subsidies variable equals zero in 6240 observations). This implies that subsidies are likely to be granted in a non-random manner, so that standard regression techniques for analyzing the relationship between group affiliation and subsidies would yield biased results. To solve this problem, we utilize Heckman's procedure, which simultaneously estimates the probability that a firm is granted a subsidy (selection equation) and the size of the subsidy given that it is granted (size equation). In the selection equation, the dependent variable is equal to one if a firm receives a subsidy in a particular year, and zero otherwise. In the size equation, as regressand we take the natural logarithm of the volume of subsidies divided by the firm's output. This normalization is done to account for considerable size-heterogeneity across firms in the sample. The list of explanatory variables in both equations includes controls from equation (1), since all of them ex-ante appear to be important determinants of state subsidies. We run regressions for the period 1999-2002 (thus time dummies are also included in sets of controls), allowing error terms to be correlated across observations of a given firm.

The resulting estimates are reported in Table 8. In the simple specification with one dummy for all groups, group affiliation has no statistically significant effect on the probability of receiving subsidies. It is, however, strongly negatively correlated with the size of subsidies (given that they are granted): group members get 37 percent less [17] money per unit of output from the state than stand-alones. These findings are largely confirmed when we introduce different categories of business groups. In the corresponding selection equation, the coefficient of the dummy for private groups is insignificant, and F-tests do not reject the equality of coefficients in pairs of dummies STATE GROUP and STATE, and FOREIGN GROUP and FOREIGN. Thus the probability of receiving subsidies does not differ as between groups and stand-alones in the same ownership category. Turning to estimates of the size equation, members of private (foreign) groups receive 42 (41) percent less subsidies per unit of output than private (foreign) independent firms. Difference in the size of subsidies between groups and stand-alones owned by the state is also negative, but statistically insignificant. Overall, in both specifications we find no evidence that group membership positively affects incidence or size of subsidies. This allows us to infer that subsidies as a form of preferential treatment from the state are not a source of benefits of group affiliation. Finally, it is interesting to note that other results of subsidies regressions are in line with the main findings from previous research on determinants of the allocation of subsidies in Russia (Orlov (2000)). Large firms, whose liquidation is costly (both economically and politically) for the state, are more likely to receive subsidies. Another mechanism for dispensing patronage and maintaining political support for the incumbent politicians (Shleifer and Vishny (1994)) is state ownership: we observe that both the probability of receiving subsidies and the amount of state support are significantly higher for state firms than for private ones.

Let us now consider the case of indirect state support, tax arrears. We define the stock of tax arrears as the sum of balance sheet items 'arrears to the budget' and 'arrears to extra-budgetary (social security) funds' for the end of year. Compared to (monetary) subsidies, whose total amount fluctuated around one percent of the sample output throughout the observed period, the magnitude of tax arrears in the sample is far larger. In 1998, the total amount of tax arrears constituted 19 percent of the sample output. In the first post-crisis year, 1999, arrears fell sharply to 11 percent of total sample sales and then gradually declined to 4 percent in the end of 2002. Tax arrears are zero in less than ½ percent of the observations in our panel. Therefore, to analyze the relationship between arrears and group membership, we do not correct for selection, and we use the same estimation technique as in the previous section, the between-

[16] Replicating regression analysis on the reduced sample using the 'total subsidies' variable does not alter the results.
[17] exp(-0.468)-1=-0.374.

effects method. Again, we normalize the dependent variable, tax arrears, by nominal output due to wide variation of size in the sample. Another reason for doing so is to control for the amount of taxes due. While the amount of tax obligations is reported only occasionally in supplements to financial statements, the value of enterprise output appears to be the closest proxy that is available for all firms. Turning to explanatory variables, previous literature (Alfandari and Schaffer (1996), Ponomareva and Zhuravskaya (2004)) identified lack of liquidity (financial distress) as a very important source of tax arrears. We, therefore, control for the extent of firms' liquidity problems by introducing the logarithm of the current ratio[18] (current assets divided by current liabilities) as a right-hand side variable. If liquidity constraints are binding, our liquidity measure is expected to be negatively correlated with tax arrears. Other controls used are the same as in equation (1). As in the performance analysis, we estimate model specifications in which the initial level of the dependent variable is included in a set of covariates. This is done to compare cumulative changes in tax arrears between group affiliates and stand-alones.

Table 9 presents the results of our model regressions. When all groups are considered as a whole, the level of tax arrears per unit of output in group firms is 18 percent lower than that in stand-alones *over the observed period*, and the cumulative growth in arrears is smaller by 17 percent. Though similarity in these two figures implies that groups and stand-alones had the same level of arrears *before* the Russian crisis, in no case we find evidence of a positive relationship between tax arrears and group affiliation. Furthermore, contrary to the hypothesis of bigger state support for business groups, the result of a sharp post-crisis drop in arrears for group firms compared to independent ones suggests that business groups were the target of government actions to increase tax enforcement following Putin's election in 2000 (Desai et al (2007)). When different group categories are introduced, firms from private groups have 18 (17) percent smaller level (growth) of tax arrears per unit of output than private unaffiliated firms, while foreign and state groups do not significantly differ the level or growth of arrears from stand-alones of corresponding ownership categories. Thus, from both specifications of the arrears equation, we can draw the same conclusion as in the case of subsidies: possible benefits of group affiliation after the Russian crisis cannot be attributed to such a form of state support as tax arrears. Moreover, we observe that the policy of stricter tax enforcement initiated in 2000 was likely to be targeted at private groups, resulting in a sharp decline in their tax arrears. In fact, it is lack of liquidity and closeness to the state - not group lobbying or other factors - that turn out to be the major sources of the arrears phenomenon (as indicated by the large negative and highly significant coefficient of the current ratio and the positive coefficients of dummies for state firms in both level and growth equations).

6. Summary of findings and concluding remarks

In this paper we explore the performance effects of affiliation with business groups in Russia during 1999-2002. This question is important, because groups control a substantial part of the Russian economy.

OLS regression analysis reveals that group members are substantially more productive than independent firms, but their profitability is statistically indistinguishable from that of stand-alones. This result of divergence between productivity and profitability in group firms is consistent with the expropriation hypothesis that controlling owners of groups extract private benefits by siphoning profits out of their members. The extent of profit dissipation, however, varies significantly across business groups of different ownership categories. It is negligible in groups controlled by foreign owners, relatively small in state groups, and large in private domestic groups. According to our estimate, in the absence of tunneling, average ROS in members of private groups should have been 4.5 percentage points higher than the observed average value of 8 percentage points. The drastic difference in the scope of tunneling between domestic private and other groups can be reasonably attributed to both strong incentives for owners of private groups (oligarchs) to hedge against the relatively higher risk of possible future expropriation of property and close connections of oligarchs to the power structures, which enable them to minimize the costs of minority shareholders expropriation and tax evasion.

Since the results of static performance comparisons between groups and stand-alones may suffer from the problem of endogeneity of group membership, we attempt to address the endogeneity issue by looking at acquisitions of independent firms by business groups during the period under consideration. We find that groups tend to acquire better performing firms and that, in the short-run, acquisitions do not lead to significant productivity improvements for new group members, which suggests that estimates of group effect on firm productivity obtained from static comparisons may be biased upward. Unfortunately,

[18] To mitigate endogeneity problems, we use one-year lagged values of the current ratio.

the short time frame of our panel prevents us from analyzing the extent of the possible bias, as it may be the case that benefits of group affiliation become apparent only after a period of restructuring. As to the short-run effect of group acquisitions on firm profitability, it is found to be significantly negative, which confirms our OLS result on tunneling in business groups.

Finally, we examine two potential sources of benefits of membership in business groups: mutual insurance among affiliated firms and preferential treatment from the state in a form of subsidies and tolerated tax arrears. We find no evidence of their importance for group members: during the observed period groups neither had smoother rates of operating profitability nor did they receive more support from the state than unaffiliated firms. Moreover, the result that tax arrears for firms in private groups fell much faster than for independent private firms suggests that private groups were likely to be the target of government actions to increase tax enforcement following Putin's election in 2000. Together with findings from previous studies that group firms benefited from more efficient allocation of capital within groups than in the rest of the economy before the Russian financial crisis in 1998 (Perotti and Gelfer (2001)), but not when the economy entered the period of sustained growth (Shumilov and Volchkova (2004)), these results seem to support the hypothesis that advantages of group membership decline as the economic and institutional environment gradually improves.

Overall, all our results nicely fit in with the modern view in the literature of the role of business groups at different stages of country's development (Khanna and Yafeh (2007)). Groups seem to arise (often with government support) as responses to institutional voids and market imperfections, which in the context of a transition economy are especially severe in the early stage of the transition process. Substituting for inadequate external capital, labor and product markets yields substantial efficiency gains for group members. At the same time, in an environment with underdeveloped corporate governance and legal systems, groups' dark side clearly manifests itself as well: controlling owners of groups expropriate the value of minority shares and the government's tax revenues. When market institutions become more efficient, economic conditions improve, and/or when the government's approach toward the big business groups undergoes deep changes, both advantages of group affiliation and owners' ability to extract private benefits begin to deteriorate. This often results in dissolution of those groups that are excessively diversified. While our work focuses mostly on the early period of environmental improvements in the economy, future research should incorporate data from groups 'formation' (1993-1997) and 'decline' (2003-2006) phases and thus complete the empirical picture of the evolution of costs and gains of group affiliation in Russia.

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Figure 1. Distribution of sample output and employment by affiliation status

(A) Output (B) Employment

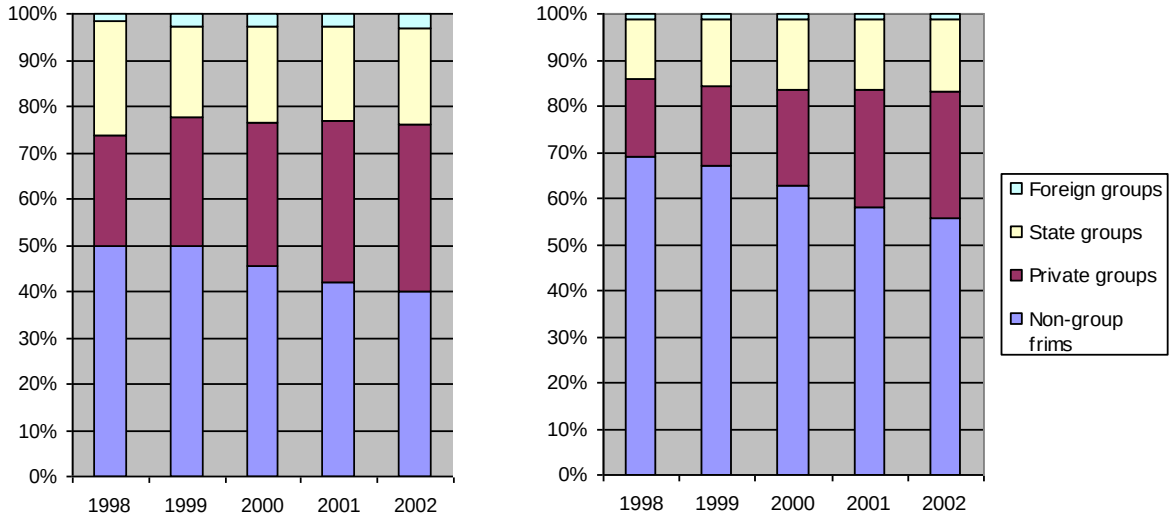


Figure 2. Groups' share in sample output by sector, 2002

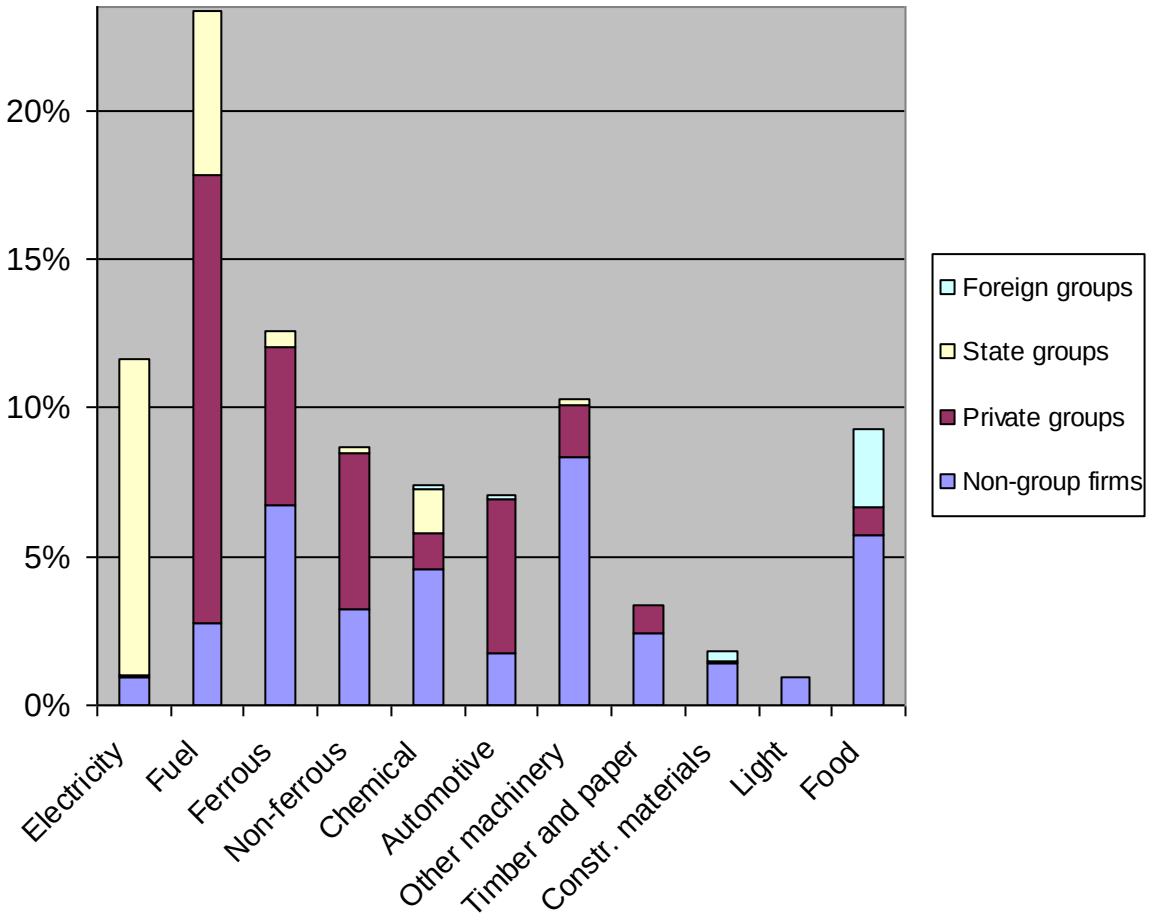


Table 1. Descriptive statistics

Figures measured in rubles are presented in 2002 prices. The sum of non-group firms and group affiliates differs from the total number of firms, because some firms changed their affiliation status during 1998-2002. The same applies to distributions of non-group firms and groups affiliates by ownership categories. T-tests are used for comparisons of means, and Wilcoxon signed-rank tests comparisons of medians between group and non-group firms of the same ownership category. Significant differences from non-group firms at the 1 percent level are denoted by *.

		Total sample	Non-group firms	Group affiliates	Non-group firms by categories			Group affiliates by categories		
					Private	State	Foreign	Private groups	State groups	Foreign groups
Number of firms		3715	3340	519	2904	387	130	313	166	54
Number of obs.		15629	13624	2005	11678	1480	466	1084	703	218
Sales, mln. rubles	mean	1033.85	521.40	4515.91*	463.09	883.76	831.98	4648.36*	5140.39*	1843.51*
	med	181.01	147.18	1445.48*	142.35	160.72	359.45	1071.06*	2621.46*	805.06*
	sd	5229.38	2323.84	12752.73	2022.00	4082.34	1390.33	14968.16	10654.86	2821.90
Employment, thous.	mean	1.80	1.30	5.20*	1.23	1.97	1.04	5.52*	6.02*	1.00
	med	0.68	0.59	2.38*	0.59	0.66	0.50	2.25*	4.02*	0.73*
	sd	4.73	3.03	9.93	2.89	4.17	1.29	11.97	7.34	1.04
Total assets (end of year), mln. rubles	mean	1577.66	676.20	7703.08*	562.64	1520.62	840.02	7158.10*	10349.36*	1879.38*
	med	197.58	161.01	2113.90*	150.03	235.35	342.65	1152.30*	6126.25*	1142.25*
	sd	9584.04	3225.66	24546.25	2538.10	6584.61	1592.38	29846.49	18052.66	2425.67
Fixed assets (end of year), mln. rubles	mean	704.81	301.05	3448.40*	249.58	677.66	394.62	2822.82*	5237.22*	790.57*
	med	79.12	64.96	737.39*	61.37	97.38	134.40	418.17*	2724.55*	408.58*
	sd	4212.92	1579.27	10621.55	1228.39	3261.54	902.98	11957.45	9747.68	1218.39
Labor productivity, mln.rubles per employee	mean	0.43	0.35	0.95*	0.33	0.35	1.09	0.74*	0.81*	2.45*
	med	0.25	0.23	0.59*	0.22	0.23	0.62	0.44*	0.67*	1.10*
	sd	0.80	0.52	1.68	0.41	0.38	1.61	1.16	0.72	3.88
Return on sales	mean	0.06	0.06	0.10*	0.06	0.04	0.11	0.08*	0.11*	0.20*
	med	0.07	0.07	0.09*	0.07	0.07	0.10	0.08*	0.09*	0.22*
	sd	0.20	0.20	0.19	0.19	0.26	0.20	0.18	0.15	0.29
Return on assets	mean	0.11	0.11	0.11	0.11	0.09	0.16	0.11	0.07*	0.25*
	med	0.07	0.07	0.06	0.07	0.05	0.11	0.07	0.04	0.23*
	sd	0.16	0.16	0.16	0.16	0.15	0.17	0.15	0.11	0.22
Sales growth	mean	0.13	0.13	0.14	0.13	0.12	0.24	0.15	0.05*	0.39*
	med	0.02	0.02	0.03	0.02	0.01	0.07	0.04	-0.01	0.17*
	sd	0.64	0.63	0.74	0.63	0.61	0.75	0.80	0.51	0.95

Table 2. Performance regressions (No distinction between groups)

Between effects estimation (1999-2002). Robust standard errors in brackets. ***, ** and * denote significance at 1, 5 and 10 percent level, respectively.

Dependent variable	**Log(TFP)**		**Log(labor productivity)**		**ROS**		**ROA**	
Specification	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
Variable								
GROUP	**0.128 [0.030]*** **	**0.055 [0.018]*** **	**0.433 [0.051]*** **	**0.164 [0.028]*** **	0.012 [0.008]	0.007 [0.006]	-0.002 [0.008]	-0.002 [0.007]
Initial level of dependent variable		**0.699 [0.011]*** **		**0.773 [0.014]*** **		**0.421 [0.016]*** **		**0.644 [0.019]*** **
Initial size			**0.052 [0.013]*** **		**0.012 [0.002]*** **	**0.005 [0.002]*** **	**0.005 [0.002]** **	0.001 [0.002]
New firm dummy	0.053 [0.045]	0.036 [0.034]	0.072 [0.063]	0.048 [0.037]	**-0.029 [0.009]*** **	**-0.023 [0.008]*** **	**-0.038 [0.010]*** **	**-0.019 [0.008]** **
Stopped reporting dummy	**-0.346 [0.034]*** **	**-0.175 [0.021]*** **	**-0.403 [0.038]*** **	**-0.179 [0.023]*** **	**-0.103 [0.007]*** **	**-0.064 [0.006]*** **	**-0.104 [0.006]*** **	**-0.066 [0.005]*** **
Industry dummies	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**0.345 [0.042]*** **	**0.110 [0.025]*** **	**0.330 [0.095]*** **	**0.149 [0.046]*** **	**0.080 [0.014]*** **	**0.048 [0.011]*** **	**0.075 [0.017]*** **	**0.028 [0.013]** **
Observations	12486	11880	11880	11880	11880	11880	11880	11880
Number of firms	3715	3628	3628	3628	3628	3628	3628	3628
R-squared	0.08	0.64	0.41	0.79	0.16	0.46	0.18	0.49

Table 3. Performance regressions (Different categories of groups)
Between effects estimation (1999-2002). Robust standard errors in brackets. ***, ** and * denote significance at 1, 5 and 10 percent level, respectively.

Dependent variable	**Log(TFP)**		**Log(labor productivity)**		**ROS**		**ROA**	
Specification	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**
Variable								
PRIVATE GROUP	**0.111 [0.040]*** **	**0.050 [0.025]** **	**0.260 [0.049]*** **	**0.090 [0.029]*** **	**-0.017 [0.009]** **	**-0.012 [0.006]***	**-0.025 [0.009]*** **	**-0.015 [0.007]** **
STATE GROUP	0.022 [0.042]	0.039 [0.025]	0.122 [0.090]	0.032 [0.052]	-0.004 [0.016]	0.004 [0.013]	-0.019 [0.014]	-0.001 [0.013]
FOREIGN GROUP	**0.524 [0.077]*** **	**0.154 [0.055]*** **	**1.454 [0.117]*** **	**0.719 [0.077]*** **	**0.129 [0.018]*** **	**0.084 [0.016]*** **	**0.083 [0.021]*** **	**0.045 [0.021]** **
STATE	**-0.175 [0.039]*** **	-0.036 [0.025]	**-0.105 [0.044]** **	0.026 [0.026]	**-0.016 [0.008]** **	-0.004 [0.006]	**-0.028 [0.007]*** **	-0.004 [0.006]
FOREIGN	**0.464 [0.072]*** **	**0.148 [0.040]*** **	**0.794 [0.095]*** **	**0.275 [0.047]*** **	**0.042 [0.011]*** **	**0.028 [0.009]*** **	**0.038 [0.013]*** **	0.014 [0.010]
Initial level of dependent variable		**0.693 [0.012]*** **		**0.755 [0.014]*** **		**0.415 [0.016]*** **		**0.638 [0.019]*** **
Initial size			**0.068 [0.012]*** **		**0.013 [0.002]*** **	**0.006 [0.002]*** **	**0.007 [0.002]*** **	0.001 [0.002]
New firm dummy	0.034 [0.043]	0.030 [0.033]	0.052 [0.057]	0.038 [0.035]	**-0.029 [0.009]*** **	**-0.023 [0.008]*** **	**-0.038 [0.010]*** **	**-0.019 [0.008]** **
Stopped reporting dummy	**-0.337 [0.033]*** **	**-0.175 [0.021]*** **	**-0.396 [0.037]*** **	**-0.187 [0.023]*** **	**-0.102 [0.008]*** **	**-0.065 [0.006]*** **	**-0.102 [0.006]*** **	**-0.066 [0.005]*** **
Industry dummies	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	**0.331 [0.042]*** **	**0.107 [0.025]*** **	**0.248 [0.093]*** **	**0.107 [0.048]** **	**0.074 [0.014]*** **	**0.044 [0.011]*** **	**0.071 [0.017]*** **	**0.026 [0.013]** **
Observations	12448	11880	11880	11880	11880	11880	11880	11880
Number of firms	3715	3628	3628	3628	3628	3628	3628	3628
R-squared	0.10	0.65	0.45	0.80	0.18	0.46	0.19	0.49
P-values								
Private group= =State group	0.109	0.742	0.143	0.322	0.403	0.216	0.658	0.307
Private group= =Foreign group	0.000	0.081	0.000	0.000	0.000	0.000	0.000	0.006
State group= =State control	0.000	0.025	0.018	0.916	0.479	0.584	0.530	0.876
Foreign group= =Foreign control	0.571	0.950	0.000	0.000	0.000	0.003	0.072	0.178

Table 4. Effects of joining groups

Fixed effects regressions (1998-2002). Time dummies are included in all regressions, but their coefficients are not reported. Standard errors in brackets. ***, ** and * denote significance at 1, 5 and 10 percent level, respectively.

Panel A

Dependent variable	**Log(labor productivity)**	**ROS**	**ROA**
Independent Variable			
GROUP	-0.025 [0.029]	-0.009 [0.008]	-0.012 [0.008]
Log(employment)		**0.037** **[0.004]***	**0.049** **[0.004]***
Constant	**12.349** **[0.007]***	**-0.196** **[0.028]***	**-0.249** **[0.028]***
Observations	3715	3715	3715
Number of firms	15629	15629	15629
R-squared	0.01	0.03	0.01

Panel B. Dummy GROUP=0 in year of joining group

Dependent variable	**Log(labor productivity)**	**ROS**	**ROA**
Independent Variable			
GROUP	0.030 [0.029]	-0.003 [0.008]	-0.005 [0.008]
Log(employment)		**0.037** **[0.004]***	**0.049** **[0.004]***
Constant	**12.344** **[0.007]***	**-0.197** **[0.028]***	**-0.249** **[0.028]***
Observations	3715	3715	3715
Number of firms	15629	15629	15629
R-squared	0.01	0.03	0.01

Panel C

Dependent variable	**Log(labor productivity)**	**ROS**	**ROA**
Independent Variable			
PRIVATE GROUP	-0.046 [0.030]	**-0.021** **[0.008]****	**-0.023** **[0.008]****
Log(employment)		**0.037** **[0.004]***	**0.049** **[0.004]***
Constant	**12.349** **[0.006]***	**-0.196** **[0.028]***	**-0.248** **[0.028]***
Observations	3715	3715	3715
Number of firms	15629	15629	15629
R-squared	0.01	0.03	0.01

Table 5. Probability of being acquired by a group

Probit model. Dependent variable is equal to 1 if a firm becomes a group (private group) member in year t. All existing group affiliates (those firms that were group members for the whole period 1998-2002 as well as new members before and after the time of joining groups were removed from the sample. The estimation sample includes all firm-years (1999-2001) with performance indicators (labor productivity, ROA, ROS) available for years t, (t+1) and non-missing data in year (t-1) for any of the variables listed. Industry, regional and year dummies are included in regressions, but their coefficients are not reported.

Variable	GROUP	PRIVATE GROUP
Log(capital) (t-1)	**0.27**	**0.26**
	[0.03]* **	**[0.03]*** **
Log (labor productivity) (t-1)	0.03	0.06
	[0.06]	[0.07]
ROS (t-1)	**0.69**	**0.73**
	[0.35] **	**[0.39]* **
Log (Total debt/Total assets) (t-1)	**0.16**	**0.15**
	**[0.09]* **	**[0.09]* **
Observations	5222	4665
Pseudo R-squared	0.23	0.24

Table 6. Average treatment effects on the treated (ATT)

Nearest neighbor matching (with replacement).

Panel A. Acquisitions by groups as a whole

Number of treated: 94. Number of controls: 90.

	Log(labor productivity)	ROS	ROA
Acquisition year	-0.02	-0.019	-0.014
	[0.12]	[0.019]	[0.018]
One year later	-0.01	**-0.032**	-0.022
	[0.12]	**[0.020]* **	[0.016]

Panel B. Acquisitions by private groups

Number of treated: 77. Number of controls: 69.

	Log(labor productivity)	ROS	ROA
Acquisition year	-0.04	-0.025	-0.027
	[0.13]	[0.023]	[0.023]
One year later	-0.06	**-0.057**	**-0.036**
	[0.14]	**[0.026]* **	**[0.022]* **

Table 7. Risk sharing and operating profitability

Between-effects estimation (1999-2002). Dependent variable is the standard deviation of operating profitability (ROA). Firms with ROA above 1 or below -1 are excluded from the analysis. Industry and regional dummies are included in each regression, but their coefficients are not reported. Robust standard errors in brackets. ***, ** and * denote significance at 1, 5 and 10 percent level, respectively.

Variable		
GROUP	0.0041 [0.0033]	
PRIVATE GROUP		0.0048 [0.0040]
STATE GROUP		-0.0085 [0.0059]
FOREIGN GROUP		0.0133 [0.0088]
STATE		-0.0047 [0.0033]
FOREIGN		0.0088 [0.0070]
ROA	**0.2180** **[0.0111]*** **	**0.2159** **[0.0113]*** **
Log(employment)	**-0.0035** **[0.0010]*** **	**-0.0035** **[0.0010]*** **
New firm	**0.0083** **[0.0047]***	**0.0080** **[0.0047]***
Dropped out	0.0005 [0.0035]	0.0007 [0.0034]
Constant	**0.0828** **[0.0097]*** **	**0.0809** **[0.0097]*** **
Observations	12106	12106
Number of firms	3450	3450
R-squared	0.26	0.26
P-values		
Private group=State group		0.044
Private group=Foreign group		0.376
State group=State control		0.556
Foreign group=Foreign control		0.686

Table 8. Subsidies regressions

Heckman's estimation procedure (1999-2002). In selection equation, dependent variable is equal to 1 if the firm receives a subsidy in a particular year, 0 otherwise. In size equation, dependent variable is the natural logarithm of subsidies normalized by output. Industry, regional and time dummies are included in each regression, but their coefficients are not reported. Standard errors, adjusted for clustering at firm level, in brackets. ***, ** and * denote significance at 1, 5 and 10 percent level, respectively.

	Selection equation		**Size equation**	
Variable				
GROUP	-0.053 [0.066]		**-0.468** **[0.167]***	
PRIVATE GROUP		-0.076 [0.078]		**-0.540** **[0.176]***
STATE GROUP		**0.322** **[0.127]****		**0.605** **[0.334]***
FOREIGN GROUP		-0.248 [0.169]		-1.007 [0.690]
STATE		**0.166** **[0.061]***		**0.824** **[0.167]***
FOREIGN		-0.138 [0.107]		-0.486 [0.334]
Log(employment)	**0.456** **[0.019]***	**0.452** **[0.019]***	**-0.133** **[0.071]***	**-0.174** **[0.072]****
New firm dummy	**-0.120** **[0.071]***	**-0.121** **[0.072]***	**-0.423** **[0.249]***	**-0.422** **[0.245]***
Stopped reporting dummy	-0.038 [0.056]	-0.051 [0.056]	**0.298** **[0.166]***	0.241 [0.162]
Constant	**-2.971** **[0.169]***	**-2.936** **[0.170]***	**-5.676** **[0.680]***	**-5.348** **[0.682]***
Observations	12100	12100		
Uncensored observations (Subsidies>0)	5860	5860	5860	5860
P-values				
Private group = State group		0.003		0.001
Private group = Foreign group		0.347		0.508
State group = State control		0.247		0.546
Foreign group = Foreign control		0.575		0.492

Table 9. Tax arrears regressions

Between-effects estimation (1999-2002). Dependent variable is the natural logarithm of tax arrears normalized by output. Industry and regional dummies are included in each regression, but their coefficients are not reported. Standard errors in brackets. ***, ** and * denote significance at 1, 5 and 10 percent level, respectively.

Specification	**1**	**1**	**2**	**2**
Variable				
GROUP	**-0.194 [0.072]*** **		**-0.189 [0.049]*** **	
PRIVATE GROUP		**-0.189 [0.078]** **		**-0.193 [0.057]*** **
STATE GROUP		**0.385 [0.157]*** **		0.140 [0.093]
FOREIGN GROUP		**-0.457 [0.183]*** **		**-0.365 [0.117]*** **
STATE		**0.599 [0.075]*** **		**0.233 [0.051]*** **
FOREIGN		**-0.680 [0.129]*** **		**-0.234 [0.095]** **
Log(employment)	**-0.058 [0.020]*** **	**-0.074 [0.020]*** **	-0.014 [0.014]	-0.022 [0.014]
Log(current ratio)	**-1.109 [0.032]*** **	**-1.096 [0.031]*** **	**-0.386 [0.027]*** **	**-0.394 [0.027]*** **
Initial level of tax arrears			**0.655 [0.015]*** **	**0.643 [0.015]*** **
New firm dummy	**-0.346 [0.094]*** **	**-0.325 [0.091]*** **	-0.064 [0.062]	-0.062 [0.062]
Stopped reporting dummy	**0.751 [0.059]*** **	**0.718 [0.058]*** **	**0.487 [0.041]*** **	**0.478 [0.041]*** **
Constant	**-0.562 [0.124]*** **	**-0.568 [0.121]*** **	-0.061 [0.098]	-0.071 [0.097]
Observations	11760	11760	11760	11760
Number of firms	3616	3616	3616	3616
R-squared	0.50	0.52	0.75	0.75
P-values				
Private group = State group		0.000		0.001
Private group = Foreign group		0.171		0.175
State group = State control		0.223		0.357
Foreign group = Foreign control		0.316		0.381

Appendix A. Data cleaning procedures

The FCSM data are rich both in the number of large and medium-size firms covered and in financial variables. However, substantial cleaning was required to achieve a good quality database. The major problems we encountered while checking the data were the following: incorrect industry codes; inconsistencies between measurement units of different financial statements within the same report; inconsistencies between measurement units of neighboring observations in individual time-series; misplaced columns 'for the current year' and 'for the preceding year' in income statements; wrong arithmetical signs of items in income statements (eg costs cannot be negative).

We automated the cleaning process by using correcting programs that compared control figures in different reports in individual series (sales, total assets and industry codes), in balance sheets and income statements (item 'undistributed profit/loss for the current period' is present in both statements), and within income statements (profit/loss is a linear combination of several items). Questionable cases that could not be resolved automatically (such as a big difference in sales and/or total assets before and after some date, non-existing industry codes, etc) were then corrected manually. We also made every effort to check whether missing values of variables of interest (profits, tax arrears, subsidies) in financial statements could be replaced with zeros.

Appendix B

Table B1. Major business groups in Russia as of 2002

Groups are presented in alphabetical order. Ultimate owners: DP (domestic private); F (foreign); FG (federal government); RG (regional government). If bank was initial central element of a group, its name is reported in column Bank. Names of failed banks in parentheses.

Nr	Group name	Owner	Bank	Subgroup	Major Industries	Biggest mining and manufacturing JSCs
1	**AFK Sistema**[19]	DP			machinery	Mikron
2	**Alfa – Renova**	DP	Alfabank	**Alfa group**	pulp&paper	Volga
					ferrous	Amurmetall
					chemical (pharm.)	Akrikhin
				SUAL (Renova)	non-ferrous (aluminium)	Kamensk-Uralsky Metallurgical Works; North-Ural Bauxite Mine; Kandalaksha Aluminium Smelter; Nadvoitsky Aluminium Smelter
					metal products (cable)	Irkutsk Cable Plant
				TNK	oil	Samotlorneftegaz; Nizhnevartovskoe NP; Nizhnevartovskneftegaz; TNK-Nyagan; Tyumenneftegaz; Ryazan OR
				SIDANKO (TNK)	oil	TNK-Nizhnevartovsk; Udmurtneft; Variegan neftegaz; Saratov OR; Saratovneftegaz
				ONAKO (TNK)	oil	Orenburgneft; Orsknefteorgsintez; Orenburggeologiya
3	**Amtel**	DP			chemical (tyres)	Kirov tyre plant; Voronezh tyre plant
4	**APK Cherkizovsky**	DP			meat	Cherkizovsky Meat Plant; Birulyovsky MP
5	**AvtoVAZ – SOK**	DP			automotive	AvtoVAZ; Plastik; Izhmash-avto
6	**Baltic Beverages Holding**	F			beer	Baltika; Yarpivo; Tula Beer
7	**Basic Element**	DP		**Rusal**	non-ferrous (aluminium)	Bratsk Aluminium Smelter; Krasnoyarsk AS; Samara Metallurgical Plant; Achinsk Alumina Refinery; Novokuznetsk AS; Belaya Kalitva MP
				Ruspromavto	automotive	GAZ; Avtodizel; Ural Car Factory; Pavlovsky Autobus; Likinsky Autobus; Volzhskie Motory; TvEx
				Kontinental Management	pulp&paper	Baikalsky PPM; Selenginsky PCM
8	**Bashneftekhim**	RG			oil	Ufaneftekhim; Novo-Ufimsky oil refinery
					chemical	Ufaorgsintez
9	**Concern Babaevsky**	DP	(Inkombank)		confectionary	Babaevsky CC; Sormovskaya Confectionary Plant
10	**Energomashkorporatsiya**	DP			machinery	UETM; Belgorodenergomash
11	**Evrazholding**	DP			ferrous (steel)	Nizhny Tagil Iron&Steel Plant; Zapsib ISP; Kuznetsk ISP
					coal	Raspadskaya Mine

[19] Major business of AFK Sistema is concentrated in telecoms sector.

Table B1 (continued)

Nr	Group name	Owner	Bank	Subgroup	Major Industries	Biggest mining and manufacturing JSCs
12	**Gazprom group**	FG			natural gas	Gazprom
					oil	Salavatnefteorgsintez
				Sibur	chemical	Omskshina; Yaroslavl Tyre Plant; Sibur-Neftekhim; Kemerovo Azot; Metafrax; Sibur-Khimprom; Voronezhsintezkauchuk
				AC Azot	chemical (fertilizers)	Kirovo-Tchepetsk Chemical Plant; Berezniki Azot; Cherepovetsky Azot
				Gazmetall	ferrous	Oskolsky Metallurgical Plant; Lebedinsky OMPE
13	**Guta**	DP	Guta-bank		confectionary	Rot Front; Krasny Oktyabr CP
14	**Ilim Pulp**	DP			pulp&paper	Kotlas Pulp&Paper Mill; Bratsk PPM; Ust-Ilimsk Forest Plant
15	**Interros**	DP	(Unex-im)/Rosbank	**Norilsk Nickel**	non-ferrous	MMC Norilsk Nickel; Kolskaya MMC
				Permskie Motory	machinery	Perm Engine Company; Proton-PM
				Silovye Mashiny	machinery	Leningradsky Metal Plant; Elektrosila
16	**Lukoil**	DP			oil	Lukoil-Perm; Komi TEK
17	**MDM Group**	DP	MDM-bank	**Pipe Metallurgical Company**	ferrous (pipes)	Volzhsky Pipe Plant; Seversk PP; Tagmet
				Evrokhim	chemical (fertilizers)	Nevinnomyssky Azot; Novomoskovsky Azot
				SUEK	coal	Vostsibugol
18	**Metalloinvest**	DP	(Rossisky Kredit)		ferrous	Mikhailovsky OMPE; Stoilensky OMPE; Orel Steel-rolling Plant
19	**RAO UES**	FG			electricity	Mosenergo; Tyumenenergo; Lenenergo; Sverdlovenergo; Kuzbassenergo; Samaraenergo; Permenergo
20	**Rosneft**	FG			oil	Purneftegaz; Sakhalinmorneftegaz; Krasnodarneftegaz; Komsomolsk OR
21	**Severstal Group**	DP			ferrous (steel)	Severstal; Cherepovets Steel-Rolling Plant
					automotive	UAZ; Zavolzhsk Motor Factory
					coal	HC Kuzbassugol mines
22	**Sibmashholding**	DP			machinery	Altai Tractor; Altai Diesel
23	**Sibneft/Millhouse Capital**	DP			oil	Noyabrskneftegaz; Omsk OR
				Planeta Management	milk&meat	Klinsky Meat Plant; Petmol; Samaralakto
						Omsky Bacon
24	**Slavneft**	FG			oil	Megionneftegaz; Yaroslavmefteorgsintez

Table B1 (continued)

Nr	Group name	Owner	Bank	Subgroup	Major Industries	Biggest mining and manufacturing JSCs
25	**Sun Interbrew**	F			beer	Klin Brewery; Rosar; Povolzhie
26	**Surgutneftegaz**	DP			oil	Surgutneftegaz
27	**Tatneft – Nizhnekamskshina**	RG			oil	Tatneft
					chemical (tyres, rubber)	Nizhnekamskshina; Efremov synthetic rubber
28	**TVEL**	FG			nuclear fuel	Machine-Building Plant, Novosibirsk Chemical Concentrate Plant, Chepetsk Mechanical Plant, Priargunskiy Mining and Chemical Production Association
29	**UGMK**	DP			non-ferrous (copper)	Uralelectromed; Middle-Ural Copper-Smelting Factory; Gaisky Ore Mining and Processing Enterprise; Kirovskiy Non-ferrous Metals Treatment Plant
					ferrous	Kachkanarsky OMPE; Metallurgical Plant Serova
					coal	HC Kuzbassrazrezugol collieries
					mach.&metal products	Sibkabel; Shadrinsky Avtoagregatniy Zavod
30	**United Heavy Machinery (Uralmash-Izhora Group)**	DP			machinery	Izhorskie Zavody; Uralmash; Almaz Shipbuilding Company
31	**VSMPO – Avisma**	DP			non-ferrous (titanium)	Avisma; VSMPO
32	**Wimm-Bill-Dann**	DP			milk	Lianozovsky Milk Plant; Tsaritsinsky Milk Plant
33	**Yukos**	DP	(Menatep)/Menatep SPb		oil	Yuganskneftegaz; Samaraneftegaz; Tomskneft; Angarsk Petrochemical Company; Novokuibyshevsk OR; Syzran OR
				FOSAGRO	chemical (fertilizers)	Apatit; Ammofos; Voskresensk Fertilisers
					food products	Russky Product

Appendix C. Sample representativeness

Firms in the resulting sample constitute a substantial part of the Russian industry. As Table C1 reports, in the first year, 1998, they accounted for 40 percent of the total number of employees in the industry and over 53 percent of total industrial output. Corresponding figures for other years are only slightly lower than for 1998. Nor does the number of observations (maximum is 3332 in 1999) vary much over the years. Some decrease in firms' coverage between 2001 and 2002 is due to technical problems in switching to a different format of enterprise reports in 2003. The majority of firms in the sample with missing 2002 data continued disclosure reporting in consecutive years (and we distinguish them from companies that discontinued reporting). Moreover, the proportion of group firms in the set of dropped enterprises is almost the same as in the whole sample. It is thus unlikely that selection bias issues associated with smaller number of observations in the end of the panel are a major source of concern.

Figure C1 presents distributions of firms in the sample and in the total industrial population by sectors in 2001. Since we do not consider very small firms in our study, sample distribution, compared to that of the whole industry, should be expected to be biased towards sectors with higher average firm size. Indeed, as seen from the Figure, sectors with the highest average firm employment (electricity, fuel industry, and metallurgy) are overrepresented in the sample, while sectors with the smallest firm size (timber and paper, and light industry) are underrepresented.

Because the contribution of small firms to total industrial output is small, the sample distribution of output across sectors should be similar to that of the industry as a whole. These distributions are shown in Figure C2. As expected, in terms of output shares, all sectors are quite adequately represented in the sample as compared to the population of manufacturing firms, though a slight bias towards more concentrated industries remains.[20]

Finally, we compare the regional structure of the sample with that of the total population. Figure C3 shows the distributions of firms by federal district. Shares of five of seven districts in the sample are similar to the population figures. The share of the North-Western district is smaller than in the population, whereas the Volga district is overrepresented in the sample. These discrepancies can be in large part explained by the fact that relatively few big firms are located in the North-Western district, and there are relatively more large and upper medium size firms in Volga region ('1000 Best Russian Enterprises', 2003). Indeed, if we look at the regional distribution of output (Figure C4), five districts remain to be adequately represented in the sample, the difference in the sample and population shares for North-Western district almost disappears, and the corresponding difference for Volga district becomes less pronounced.

A similar picture evolves when we compare our sample with the total population in other years (corresponding statistics are not reported, to save space). We can thus conclude that the sample is reasonably representative of the universe of large and medium size Russian manufacturing firms in terms of sectors and regions.

Table C1. Sample coverage

Total sample employment and output, percent of Russian industry

	1998	1999	2000	2001	2002
Number of observations	3143	3332	3305	3098	2751
Employment	40.0	39.6	39.5	39.6	36.7
Output	53.4	53.2	52.5	52.7	50.7

[20] As to distribution of employment by sector, Rosstat provides statistics only on 'industrial employment' (promyshlenno-proizvodstvenny personal). This indicator differs from 'total firm employment' in our database. As a rough check, we compared distributions of these two measures by sectors. The resulting picture is similar to the case of the distribution of output across industries.

Figure C1. Distribution of firms across industries

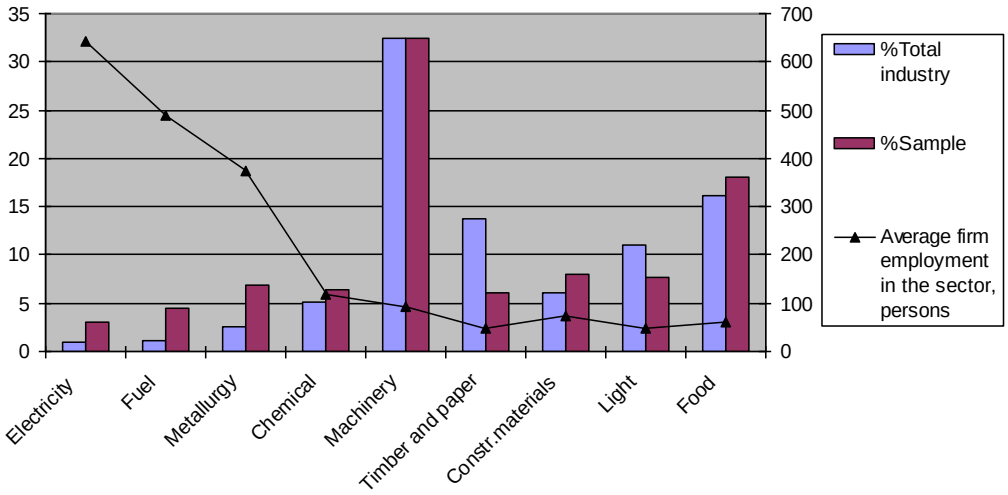


Figure C2. Distribution of output across industries

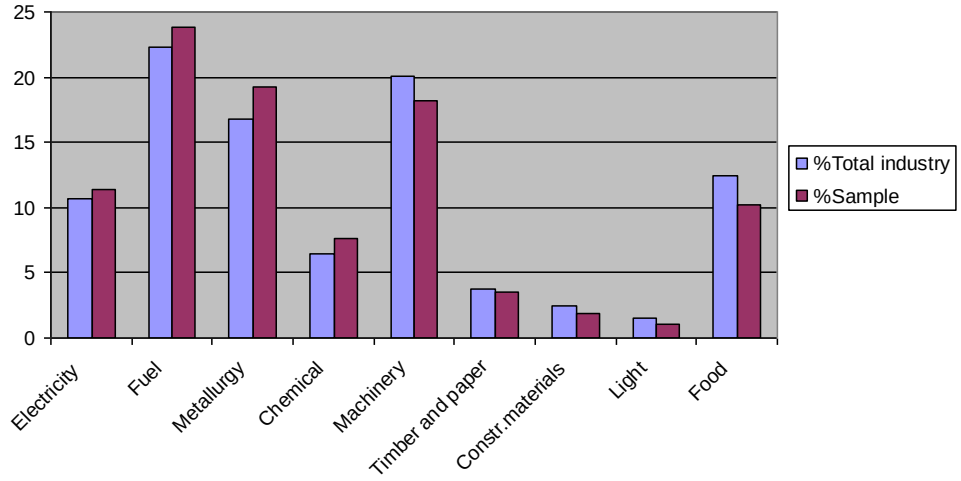


Figure C3. Distribution of firms across regions

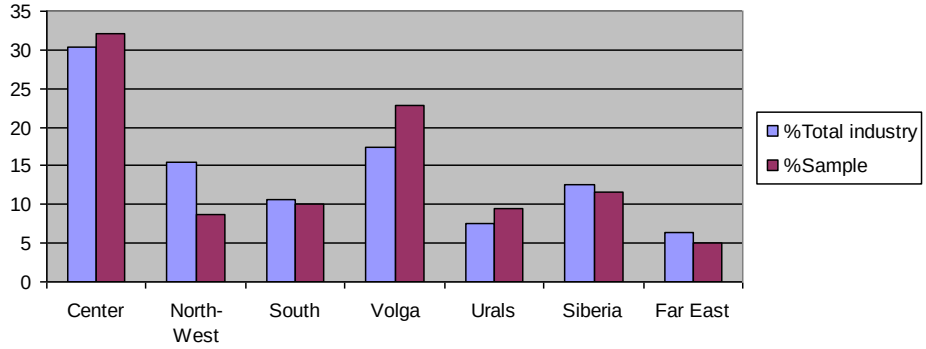
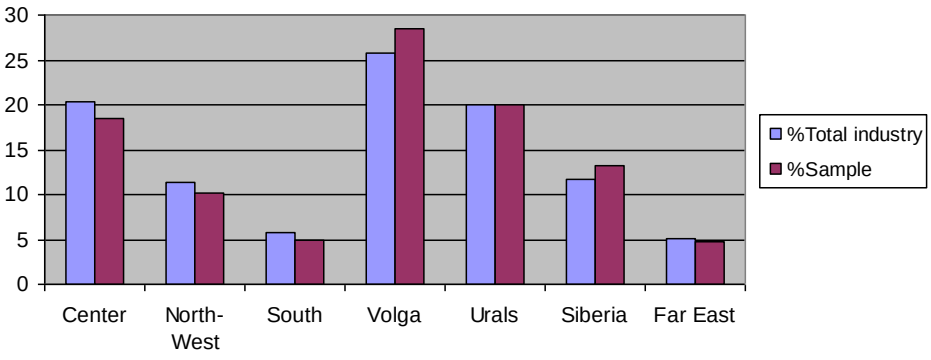


Figure C4. Distribution of output across regions



Appendix D

Table D1. Summary statistics for variables used in Section 4

Based on maximum-size sample in regressions.

	Observa-tions	Mean	Median	St.dev.	Min	Max
Standard deviation of ROA	3450	0.075	0.058	0.064	0.000	0.459
ROA	12106	0.120	0.081	0.159	-0.807	0.897
Log(Employment)	12448	6.629	6.525	1.185	3.401	11.711
Log(Subsidies/Sales)	5860	-7.017	-6.989	2.738	-15.365	3.291
Log(Tax Arrears/Sales)	12352	-2.921	-3.107	1.671	-9.932	4.308
Log(Current ratio)	12352	0.201	0.150	0.724	-3.193	3.890