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Company Performance in Ukraine

What Governs its Success

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The observable outcomes of post-Soviet economic reforms have generated large interest and controversy in the transition debate. Privatization and market competition are the two primary forces to induce changes in the firm behavior. The author investigates how firm performance responds to these forces by modeling firm performance in Ukraine. Drawing from panel data on Ukrainian firms for 1996–2000, the study estimates a production function using random-effects and instrumental variable estimators. The analysis finds evidence that firm performance improves significantly with privatization. This effect is particularly strong when several private owners concentrate ownership. There is indication that privatized companies with dominant outside shareholders are most efficient. Another finding is that market competition has little role in determining firm performance in Ukraine.

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1. INTRODUCTION

In a recent decade, a considerable literature has evolved concerning the impact of transition reform on firms in former socialist economies. Generally using longitudinal analysis, many studies have tried to estimate the extent to which these economies are moving towards market competition, the success or failure of privatization, dominance of insider or outsider ownership, and observable outcomes of other transition reforms. However, notwithstanding the many insights it has provided, this literature has often failed to reach a consensus on the effects of specific reforms and the extent to which a market economy is in place.

This study attempts to shed light on the causes of post-reform differences in the performance of Ukrainian firms. The big question is: what explains success or otherwise of firms in the transition economy of Ukraine? Which firms are able to grow and to consistently maintain improving productivity rates vis a vis others being trapped on the performance level close to failure? What are the factors that most influence outcomes of the firm behavior in Ukraine? Using 1996−2000 longitudinal data for 1,211 firms in various ownership, competition, and restructuring conditions and controlling for industry, region and time fixed-effects, this paper addresses one component of this multidimensional issue.

The narrow question for study is the effect of ownership structures (private *vs.* state, concentrated *vs.* diluted, insider- *vs.* outsider-dominant) and market competition on firm performance in Ukraine. Accompanying by industry and location, these factors are probably the most important observable determinants of performance outcomes. Here and throughout the study, the ownership effect on firm efficiency implies performance changes, which private owners induce by providing new incentives for employees and managers and instituting effective corporate governance. Privatization *per se* does not achieve efficiency benefits. To ensure the transformation of incentives, a change in managerial behavior, and finally better firm performance, it must create an effective mechanism of corporate governance — a system that will assure owners of capital of receiving a maximum return on investment. Similar incentives to optimize firm behavior are induced by market competition. Thus, ownership and competition present the central interest for study, and estimation of their effects on performance is the main objective of the project. The standard production function analysis is a tool in investigating this relation.

The universe population for the study is Ukrainian medium- and large-size industrial firms. It includes traditional firms that have been formed in

the economy of the former Soviet Union, up to the onset of market reform in early 1990s. With the sample representation of 66%, the target population is Ukrainian open joint stock companies, the core component of the Ukrainian economy. Of the whole population of industrial firms, this is the largest group of firms with the share of 60% in industrial production, 50% in employment and the number of industrial firms in 2000. It therefore receives the primary attention in the analysis of firm performance in Ukraine.

This is explicitly a causation study: the big question about success or otherwise of firm performance in Ukraine translates into estimation of the effects of privatizing firms, concentrating ownership and working in a more competitive market for a firm. For example, I ask what would be the effect of implementing more extensive privatization; concentrating ownership by large shareholders vis a vis its diluting among numerous small shareholders? The standard approach to estimation of the causal effects is random assignment. Randomization of the ownership structure would ensure that every difference in the behavioral outcomes of firms — the outcome of interest — is determined by chance, and none of the omitted factors is correlated with the included variables in the model. We would then safely report estimates of the privatization effects. It is however unlikely to create an experiment in which firms are randomly assigned to the group with some ownership form, and a firm never deviates from its group. Under this limitation, the study uses panel data, which, by providing sequential observations for many firms, distinguishes between inter-firm and intra-firm differences and thus allows to estimate the "before-and-after" or causal effect.

The research faces common for the econometrician analysis problems: endogeneity of the key explanatory variable (ownership) and selection bias. The first issue arises because the Ukrainian privatization process had some systematic selection tendencies that may bias the estimates of ownership. The government policy choices on which firms to keep and how to regulate privatization of other firms were clearly non-random events. Monopolies remained mostly in state ownership while loss-making enterprises were often offered for privatization to reduce the burden of on the state budget. Alternatively, firms with good profitability prospects were more likely to be privatized in the first place and, furthermore, to prompt owners to accumulate large stock. Hence, ownership is endogenous and OLS estimation will produce biased estimates of its impact on firm performance.

This problem is a challenge to address because we deal with observable and unobservable factors in modeling firm performance. The available production resources are observed. Technology, motivation, management skills and inside information are unlikely to be easily observed and

measured. They influence firm performance but are impossible to capture in recorded data. For example, a motivated manager is more likely to be open to reform and efficiency-improving initiatives. Knowing this, investors try to accumulate shares of this firm. We however cannot measure motivation and explicitly include it in the model. Inability to do so has fatal results: we omit the variable, which is correlated with the key independent variable (ownership) and at the same time affects the outcome of interest (firm performance). The orthogonality condition is violated and OLS estimates of the ownership impact would give biased, in this example upward.

Furthermore, the problem of self-selection bias, *i.e.* nonrandomness of the sample, might be important due to reporting bias. Despite the mandate to report on performance and owners for every OJSC, some firms chose to do so while others did not, which is unlikely to be a random event. Having said that, I do not try to deal with selection bias in this study and focus on solving the endogeneity problem. Furthermore, given the panel data context, the consistent estimators may still be obtained although selection bias is present (Baltagi, 1995). The estimation results are susceptible to firms present in the sample. This sample limitation may restrict the power to generalize the results to the underlying population.

I attempt to control explicitly for observable determinants of firm performance and account for the omitted unobserved characteristics of firm behavior employing a combination of several procedures. Postulating randomly distributed individual specific terms across firms and planning to draw inferences for firms outside the sample, I use the G2SLS random-effects approach to estimate the production function model. Including firm specific controls should capture the effects of the omitted factors, which are time-invariant: industry, location, monopoly status, and privatization group. The time fixed-effects (year dummies) should account for the impact of nationwide overtime changes. Adding industry trends tests the impact of various growth rates across industries. The instrumental variables for ownership should purge the relation between the independent variable and error term.

As instrumental variables, I use observable factors that influence ownership but do not directly affect performance outcomes — to mimic a randomization of firms to different ownership structures. These are the share of privatized firms in the region and industry production and employment, industry growth in the previous period and an indicator for a leased firm[1]. Privatization was more likely to happen in the environment

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[1] I am grateful to David Brown and the EERC panel experts for pointing out the possibility of using the industry and region privatization shares as instruments.

where the pace of privatization reform was relatively high. Growing industries also motivate investors to enter markets and acquire firms from industries with best prospects. Due to Ukraine's privatization legislation, leased firms were more likely to be privatized in the first place.

The findings are threefold. First, the study provides evidence for Ukraine that firm performance improves significantly with privatization. This effect is particularly strong when several private owners concentrate ownership. There is some evidence that privatized firms with dominant outside shareholders are most efficient. Another finding is that market competition has little role in determining firm performance in Ukraine.

The reminder of this paper is organized as follows: Section 2 reviews the theoretical background and empirical evidence on the relationship between ownership and firm performance and the outcomes of market competition for firm efficiency. Section 3 describes the data. In sections 4 and 5, I outline the model specification for estimation and discuss the results. Section 6 concludes.

2. DETERMINANTS OF FIRM PERFORMANCE: THEORETICAL AND EMPIRICAL BACKGROUND

Privatisation and its impact on firm efficiency have initiated perhaps the largest interest and controversy in the transition debate. Another source of dispute has been the impact of ownership structures: diluted or concentrated, insider- or outsider-held. Additional focus has fallen on the role of market competition, hardening budget constraints, and restructuring. Finally, interactions of these factors have given rise to more research. As the following survey shows, there has been little agreement about the manner in which these different variables impact firm performance.

2.1. Ownership and Performance

Many empirical studies have developed a theme of ownership transformation but a complete consensus on its impact has not emerged. While generally anticipated to create efficiency gains, privatization somehow failed to meet expectations. Despite the mounting positive evidence for developed and most transition countries (Megginson *et al*., 1994; Frydman *et al*., 1997; Brown and Earle 2000a), the privatization success in terms of economic efficiency gains has often been difficult to pin down in Russia, Ukraine and other former Soviet republics. Where is the source of this disparity? What was wrong, if anything, with privatization

policy in these countries? Stiglitz (1999) and Boycko *et al*. (1994, 1996) relate the outcome of privatization policy in Russia to its bias towards insider (worker and manager) ownership. This bias has arisen from government attempts to gain political support during privatization, and the allocation of property rights to inside control to ensure such support. In a trade-off between achieving social equity and economic efficiency objectives, few governments in early transition sacrificed social justice. Hence, we are observing the failure of insider and mass privatization to promote efficiency growth (Earle and Estrin 1996; Aghion and Blanchard 1996; Commander *et al*., 1996).

Many studies test empirically if the type of private ownership makes a difference. In the spirit of the classic study by Berle and Means (1932), diffusion of privatized property is predicted to give weak ownership incentives and thus to impair performance outcomes. As many studies show, ownership concentration improves firm efficiency (Shleifer and Vishny 1986; Megginson *et al*., 1994). Not only better monitoring of managerial activities by shareholders promotes efficiency of firms with concentrated ownership. Findings for transition economies also relate efficiency gains to the probability of restructuring. This happens because owners push restructuring if they are satisfied with the firm governance. The consensus on the beneficial role of ownership concentration is however incomplete. Some studies find no difference in performance between diluted and concentrated firms (Demsetz 1983; Demsetz *et al*., 1985).

Another matter of debate is insider versus outsider ownership. The empirical studies on this issue produce ambiguous results. Some studies find no significant difference between the performance of insider- and outsider-owned firms (Earle *et al*., 1996). Other researchers show that insider-held firms perform better (Estrin and Rosevear, 1999), whereas still others argue for the opposite (Frydman *et al*., 1997; Brown and Earle 2000a). These differences may be related to the time framework within which the analysis is conducted. The effects of outsider privatization might require a longer period to become apparent. What also may bear on the impact of privatization is the distinction between employee and managerial ownership. Low effectiveness of employee-owned firms is depicted in many studies, it being argued that workers are much less likely to initiate deep restructuring and trim employment. Hence, lumping these ownership forms together may lead to a downward bias of findings on insider-ownership effectiveness.

Different opinions on which type of ownership has the largest positive impact on firm performance may root from the methodological and sam-

pling construction disparities. Some scholars have used rather limited or specialized samples (Megginson *et al*., 1994; Blasi and Kruse, 1995). Others approached differently the selection bias problem. It is generally recognized that the sequencing of state-owned firms to privatization was not instantaneous and random: the state kept better firms, or alternatively, first to privatization came the most profitable firms (Perevalov *et al*., 2000; Brown and Earle, 2000a; Walsh and Whelan, 2000; Gupta *et al*., 2000). To address the selection bias problem, Frydman *et al*. (1997) in their study on the Czech Republic, Hungary and Poland have used the fixed-effects (FE) procedure: controls for unobserved group-specific time-invariant characteristics. In the study on privatization in Russia, Earle and Estrin (1997) employed the instrumental variables (IV) technique while Brown and Earle (2000a) united two approaches. Using FE and IV estimators is probably the best approach to evaluate the ownership impact when the endogeneity problem besets the privatization analysis.

In essence, the hypothesis tested is that privatization improves firm performance. Most studies have shown improved firm performance measured by labor productivity and total factor productivity growth (Anderson *et al*., 1997; Earle and Estrin, 1997; Dewenter and Malatesta, 1998; Brown and Earle, 2000a, b), revenues (Megginson *et al*., 1994; Frydman *et al*., 1997; La Porta and Lopes-de-Silanes, 1997), wages (La Porta and Lopes-de-Silanes, 1997), and employment (Frydman *et al*., 1997). Megginson *et al.* (1994), La Porta and Lopes-de-Silanes (1997) show higher firm profitability but most studies on transition economies do not provide such evidence. The dominant view is that using profitability measures is questionable. Profit is a poor measure of firm efficiency in the short-run when restructuring efforts can impose high short-term costs. It is also well-known that taxable profit is subject to wide manipulations in some transition countries, particularly Russia, Ukraine. Thus, profit can hardly indicate firm performance, at least at this stage of transition.

Failure to give conclusive evidence to the beneficial role of privatization prompted many researchers to think of combinatory effects that ownership change and other reforms have in shaping firm efficiency. McMillan (1997) stressed that "neither change could be effective by itself". Thus, managerial change reinforces the positive effects of privatization (Dyck, 1997; Cragg and Dyck, 1999; Warzynski, 2000). Similarly, tense competition enhances efficiency in privatized firms alone. Brown and Earle (2000b) report that competition improves efficiency of a firm if its competitors are private. Thus, applying some policy reforms in tandem may reinforce their direct effects on efficiency growth.

2.2. Market Competition and Performance

Economic theory clearly implies that market competition enhances incentives for raising efficiency. Aghion *et al*. (1999) and Schmidt (1997) explain that a competitive market structure gives sufficient information for owners to create an effective managerial incentive system. In a more competitive environment, the increased likelihood of liquidation of an insolvent firm pushes managers to exert a maximum effort. Also, in spite of doubts concerning whether monopolies innovate less, a number of scholars find strong evidence that competition promotes innovation (Aghion *et al*., 1997; Blundell *et al*., 1999). Furthermore, as one may elicit from Hart (1983), a competitive environment helps to regulate owner-manager interactions most effectively. Nickell (1996), Konings (1997), Dutz and Hayri (1999) identify the positive role of market competition for firm efficiency. Still, La Porta and Lopez-de-Silanes (1999), Brown and Earle (2000b) fail to find efficiency gains with more intense competition. There is also evidence that the impact of competition on performance takes the form of an inverse-U shaped form. In the survey of 25 transition economies, Carlin, Schaffer *et al*. (2001) find that competition has a large non-monotonic effect on the productivity growth. Some market power is beneficial to firm growth and higher sales but there are important constraints from competitive pressure to the gains of monopoly power.

Further extensive discussion has been on government intervention. Discriminatory governmental policy towards public and private sector firms is neither new nor scanty. Kornai's "soft budget constraint" best describes the phenomenon of governmental assistance to some firms (1992). This policy may manifest itself as barriers to market entry of private firms that protect state insiders from competition, direct and indirect subsidies, easier discipline of financial markets, and so on. In the presence of government assistance, Kikeri *et al*. (1994), Barberis *et al*. (1996), and Bartel and Harrison (1999) show that state firms are inefficient in consequence of the assistance, rather than due to any impact of ownership.

3. DATA DESCRIPTION

The universe population for this study is Ukrainian medium- and large-size industrial firms. It includes traditional firms that have been formed in the economy of the former Soviet Union, up to the onset of market reform in early 1990s. Newly emerged private enterprises (so-called de

novo firms) are not the part of the study because they give no basis to evaluate the impact of ownership change. Furthermore, created in the environment of a market-oriented economy, they are likely to have different from traditional firms objectives, management, and consequently performance. This population of firms is a topic of separate research. Fig. 1 describes the universe population of industrial firms in Ukraine for the period 1992–2000.
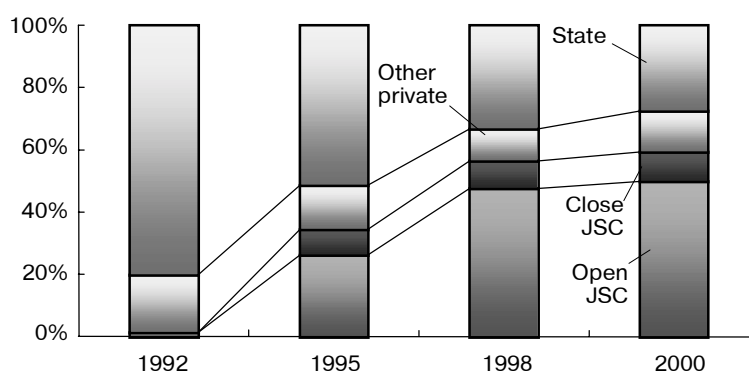
Fig. 1. The Universe Population: Medium and Large-Size Ukrainian Industrial Firms. Number of Employees by Ownership.

Source: Sample Database and the Ukrainian State Statistics Committee.

The target population for research is Ukrainian open joint stock companies (OJSCs). Of the whole population of industrial firms, this is the largest group of firms with the share of 60% in industrial production, 50% in employment and the number of industrial firms in 2000. In Ukraine, this type of firms has emerged at the onset of transition when the government tried to reform inefficient state enterprises through corporatization and privatization. Although all OJSCs went public, their shareholders have been different. For a majority of OJSCs, private owners instantly or gradually have accumulated all stock. For fewer others, state has remained the owner of all, control or blockholder shares. Today, OJSCs is a universe of firms that fully represent various types of ownership and market structures; the pace, methods and magnitude of privatization, industries and regions. This universe is the core of the Ukrainian economy, its largest and most substantial component. OJSCs are thus critical for understanding the behavior of firms in Ukraine.

There are two additional reasons to focus the study on OJSCs. This group includes JSCs owned by the state and therefore their behavior may serve a reasonable approximation of other non-JSC state firms. Under the same owner, they are likely to have similar incentives, mechanisms of governance and efficiency outcomes. In addition, performance of Ukrainian OJSCs should not differ significantly from that of closed JSCs, another important group of industrial firms. First, incentive and governance structures are similar. The influence of insiders — often through direct shareholding or trusted management of employees' shares, connections with government authorities — is very strong at closed JSCs. In contrast to the western experience, this is also true for insiders in many OJSCs, which is one of the outcomes of Ukraine's insider-oriented privatization (Estrin and Wright, 1999). Second, the period after forming closed and OJSCs (1–5 years) might be too short for potential differences to become apparent.

I collected and aggregated the firm-level and macro-data from several sources. Microdata on ownership and performance of Ukrainian firms come from the Center of Public Information of the Ukrainian State Committee on Securities and Stock Exchange. This institution collects annual reports on shareholders and financial position, mandated for OJSCs submission. Initiated in 1995, this mandate is for OJCSs only. Due to its poor enforcement, some OJCSs have not reported to the Committee on a regular basis or submitted incomplete information. The situation was particularly bad in the first two years after instituting the mandate. For example, the data for 1996–1997, available in the paper form only, matches up to 25% of firms reported in later years. Because of this attrition, the data is skewed to the 1998–2000 period.

Nevertheless, this non-survey source of the firm-level data is unique as it accumulates the largest publicly available record on shareholders and performance of an important universe of Ukrainian firms, OJSCs.[2] Furthermore, it has no alternative in today's Ukraine. There are no nationally representative surveys. Contrary to the developed markets practice, Ukrainian firms overwhelmingly attempt to disguise and misreport information on their performance and particularly on owners. Government sources of microdata are not available too. Although firms report to the tax and statistic authorities, Ukraine's legislation prohibits any disclosure of this firm-level data. Most surveys conducted at the micro-level have proprietary data on a small number of

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[2] Since 2001, the Center of Public Information has been providing data on a fee basis only. The exception is data for 1996–1997, which is currently available free-of-charge.

firms (up to 300). The sampling and data collection design were often structured to answer a narrow question of the study with little genera-zability of the data.

Privatization-related data additionally comes from the State Property Fund of Ukraine (SPFU). It incorporates the firm-level data on state shareholding, initial ownership after privatization and its changes over time, privatization methods, and some firm pre-privatization conditions. In addition, the SPFU provides data on the state and regional monopo-lies, strategic enterprises and proportions of privatized firms in the re-gion and industry production, employment and total number of firms. Standard macro-level data on industry output, employment, inflation, im-port and market concentration comes from conventional sources: the Ukrainian State Statistics Committee, National Bank of Ukraine and In-stitute of Economic Research and Policy Consulting.

The sample of 1211 firms represents 66% of the target population (OJSCs) although this number varies by year. Fig. 2 shows the sample presentation of the target group, and Fig. 3 is for the sample coverage of the universe of industrial firms. It evidences the discussion above: the distribution is slightly skewed to the later years (1998–2000). The rele-vant period for study is 1996–2000. This period has been chosen so as to avoid the huge instabilities in firm performance associated with the adverse effects of economic shocks in the early 1990s (trade and price liberalization, privatization, disorganization), and to allow sufficient time to pass for the effects of reforms to become observable.
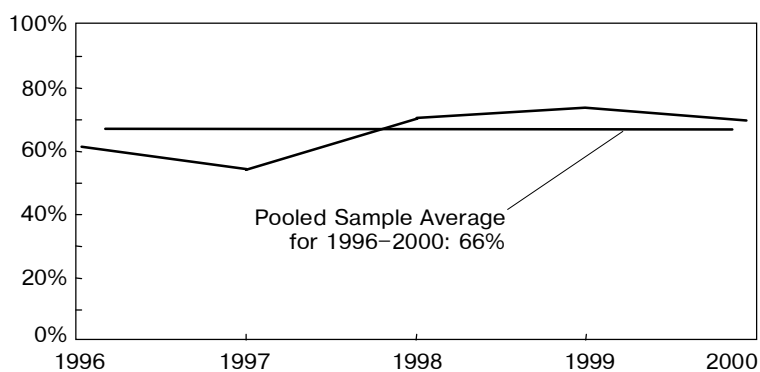
Fig. 2. Sample in the Target Population of Open Joint Stock Companies.

Source: Sample Database and the Ukrainian State Statistics Committee. The percentage in employment.
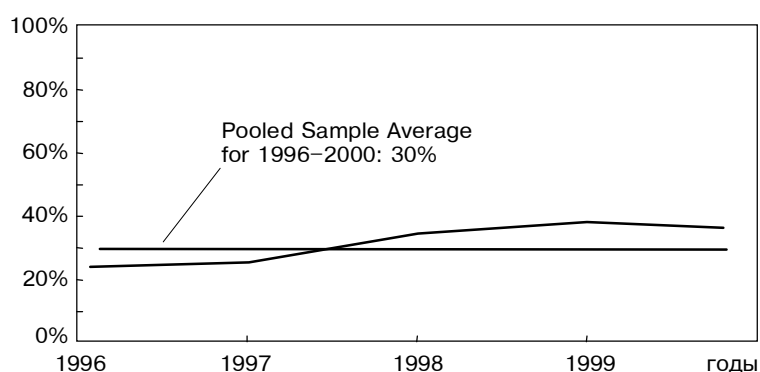
Fig. 3. Sample in the Universe Population of Medium and Large-Size Industrial Firms.

Source: Sample Database and the Ukrainian State Statistics Committee. The percentage in employment.

Data on firm performance include standard observable variables of the production function analysis: production inputs (real capital stock and labor) and production outputs (annual revenues and production volume). Monetary values are in 1995 thousand hryvnyas, deflated with industry price indices for output data and machinery price index for fixed assets. The ownership-related data include information on shareholders with more than 5% of the company stock, which distinguishes between state *vs.* private, private inside (management) *vs.* outside shareholders. The year, in which a firm is privatized (more than 50% of company shares becomes private), identifies the period of privatization with its important implications in the Ukrainian privatization (Table 1). Determined by peculiarities of Ukraine's privatization legislation, these are the sequencing of firms to privatization and the methods of ownership transformation: leased or buyouts (1992–1994), mass privatization (1995–1998) and individual cash privatization (1999–current). The sequencing of firms to privatization in the sample demonstrates large fluctuations in the Ukrainian privatization process through time (Table 2) and across privatization groups (the latter literally reflect the size and monopoly status of a firm) (Table 3). This process gave rise to different ownership structures (Table 4).

In addition to the performance and ownership data, a number of firm, industry and economic conditions are control variables. The firm-specific controls are the status of the regional, state monopoly or a strategic enterprise[3] (Table 5),

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[3] A strategic enterprise is a firm, which produces goods and services deemed strategic for the national interests of Ukraine. The government identifies the list of such enterprises.

the firm privatization group (Table 3), 5-digit industry and 2-digit region classi-fication (Table 6 and Table 7), and trade orientation, as measured by the share of exported goods in the total firm production. Data on industry-specific controls for observable differences in the firm behavior include market con-centration indices HHI (Table 8), the share of imported products in a market (import penetration), proportions of privatized firms in the industry and region production output, employment and the total number of firms.

Table 1. Variation in Firm Performance by Period of Privatization.

	Overall	Privatized in 1992−1994	Privatized in 1995−1998	Privatized in 1999−2000	Non-privatized
Labor productivity	19.5	26.0	18.28	13.79	25.7
Lagged labor productivity	19.7	31.5	16.27	14.25	29.4
Industry growth	−2.7%	−2.2%	−2.6%	−3.8%	−2.4%
Lagged industry growth	−5.5%	−5.1%	−5.5%	−5.9%	−5.6%

Source: Sample Database. All entries are averages for the period of the analysis. Labor pro-ductivity is in thousand 1995 hryvnyas.

The data is however restrictive on production costs, adjustment of the labor data for hidden unemployment, shareholders with less than 5% of the firm stock, market and ownership concentration measures in the ear-lier period of study (1996−1997). The first limitation relates to the large-scale cost overstatement in Ukraine for tax-aversion goals[4]. Given the vast profit understatement, I consider profit data exclusively as suppor-tive, and restrain the analysis to productive efficiency. Another drawback of the data is lack of the firm-level information on hidden unemployment or under-employment of the labor-force due to employer-induced unpaid leave, reduced hours of work, *etc*. It would be desirable to make these corrections in an economy beset by problems of disguised unemploy-ment; however, the available data do not allow for this option. Therefore, the evaluation of labor productivity might be less accurate and underes-timate the true labor productivity outcomes.

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[4] Ukraine's official statistics reports 2% of Ukrainian enterprises as loss-makers in 1990, 12% —1995, 30% — 1996, 45% — 1997, 54% — 1998 and 56% in 1999 correspondingly.

Table 2. Sequencing of the Sample Firms to Privatization.

Question: During past twelve months, was a firm privatized, *i.e.* at least 50% of its shares has been transferred to private owners?

Year	Count	Cum	Percent	Cum percent
1995	33	93	7.7%	7.7%
1996	136	229	11.2%	18.9%
1997	368	597	30.4%	49.3%
1998	185	782	15.3%	64.4%
1999	152	934	12.6%	77.1%
2000	58	992	4.8%	81.9%
Not privatized	219	1,211	18.1%	100.0%

Source: Sample Database.

Table 3. Sequencing of the Sample Firms to Privatization by Privatization Group.

	1996	1997	1998	1999	2000
Total sample	19%	49%	65%	77%	82%
Group A: Small-size firms	37%	82%	86%	91%	91%
Group B: Medium- and large-size firms without strategic enterprises or monopolies	23%	57%	75%	87%	91%
Group C: Strategic enterprises or monopoly firms	7%	28%	37%	51%	59%

Source: Sample Database.

Table 4:. Ownership Structure of the Sample.

	1998	1999	2000
Total number of firms	1211	1211	1211
Majority state owned	35%	23%	18%
Majority private dispersed	47%	57%	50%
Majority outsider shareholder	16%	18%	29%
Majority insider shareholder	2%	2%	3%

Source: Sample Database.

Table 5. Monopoly/Strategic Enterprise Status and Ownership of the Sample.

	State monopoly	Regional monopoly	Strategic enterprise
Total number of firms	221	85	378
Majority state owned	34%	40%	39%
Majority private concentrated	27%	14%	24%
Majority private dispersed	39%	46%	37%

Source: Sample Database.

Table 6. Industry Variation in Privatization: Proportion of Privatized Firms by Industry.

	1996	1997	1998	1999	2000
Total sample	19%	49%	65%	77%	82%
Chemical industry	24%	52%	58%	60%	64%
Construction materials	20%	68%	83%	97%	97%
Energy sector	9%	9%	14%	34%	37%
Food-processing	25%	59%	84%	92%	94%
Machinery	17%	47%	59%	70%	77%
Metallurgy	21%	51%	62%	69%	71%
Paper & wood-processing	13%	70%	74%	87%	91%
Procurement	20%	49%	62%	81%	86%
Textile industry	35%	55%	74%	81%	81%

Source: Sample Database. Percentage of firms.

Table 7. Geographic Variation in Privatization: Proportion of Privatized Firms by Region.

	1996	1997	1998	1999	2000
Total sample	19%	49%	65%	77%	82%
Eastern Ukraine	17%	49%	62%	75%	82%
Northern and central	22%	52%	69%	79%	83%
South Ukraine	17%	41%	54%	70%	76%
West Ukraine	20%	50%	67%	80%	84%

Source: Sample Database Percentage of firms.

Table 8. Market and Ownership Structure of the Sample.

	Low market concentration <25% HHI <2500	Medium market concentration 25−50% HHI 2500−5000	High market concentration >50% HHI 5000>
Total number of firms	706	320	185
Majority state owned	14%	25%	21%
Majority private concentrated	30%	36%	30%
Majority private dispersed	56%	39%	49%

Source: Sample Database

The availability of data on owners with shares above 5% restricts the analysis of insider-outsider ownership to concentrated structures only (owners with at least 25%). Private owners with shares below 5% are not distinguishable. Nevertheless, I suggest that in Ukraine dispersed inside (employees) and outside shareholders do not differ substantially in their influence on firm governance and performance, and thus can be united into one group. Both types of newly-emerged shareholders have virtually no market knowledge and experience. Furthermore, poor protection of minority ownership rights and undeveloped stock markets puts small outside and inside owners in similar conditions.

With the available data, the exact measures of market concentration in 1996–1997 cannot be calculated. I therefore impute this data from the available observations in later years postulating that the rates of change and behavioral patterns are similar in both early and later periods. I use annual differences of the average industry HHI in 1998–1999. The assumption on relative stability of the market structure may be reasonable for the Ukrainian economy, which is so far characterized by weak market dynamics. Stock markets are in the infant state. Mergers are rare events; foreign penetration is even less common. The data empirically supports this assumption: in 1998–1999, the mean annual change in market concentration was 1%.

Summary statistics for the data are presented in Table 9.

4. EMPIRICAL MODEL

In the spirit of many prior studies, I evaluate firm performance by production rather than cost efficiency. Obscure accounting standards, non-market pricing of inputs and products and large-scale tax avoidance in ex-Soviet countries, make performance measures notoriously difficult to evaluate. In this respect, profit data present the worst case, and I ignore it in the analysis. Driven by the big question of the study — what explains firm performance — I model firm productivity with standard production inputs, capital and labor, and observable factors expected to most influence efficiency of firms in transition society.

As performance indicators, I use the value of output and sale revenues, deflated using three-digit industry price indices to conduct comparison in real terms. In Ukraine, the Soviet period practice of manufacturing for its own sake (with concomitant wide-spread overstocking), rather than consumer-oriented production, was common, at least in the early years of transition. Therefore, output may sometimes give misleading inferences about firm performance. Using output and sales synchronously may help attenuate this problem.

I estimate the two-factor production function:

$$Y = F\,(A,\,K,\,L),$$

where Y is the performance indicator being estimated, K and L are production inputs, the real capital stock and labor respectively. A designates total factor productivity and is a vector of ownership and market characteristics and unobservables relegating their effect on the outcome variable to the error term. Assuming a logarithmic form for the standard

Table 9. Summary Statistics.

Variable	Mean	Standard deviation	Minimum	Maximum
Outcomes:				
Sales revenues (thousands 1995 hryvnyas)	35811.8	130403.5	0.3	2302825.0
Output (thousands 1995 hryvnyas)	29460.2	115434.1	0.2	2208328.0
Explanatory variables:				
Firm characteristics:				
Number of employees	1638	3140	12	49443
Real capital stock (in thousands of 1995 hryvnyas)	37791.8	103022.4	1.21	1756175
Private ownership, %	62.7	38.6	0	100
Concentrated private ownership, %	11.1	22.6	0	99.9
Dispersed private ownership, %	45.2	42.7	0	100
Insider ownership, %	5.2	11.1	0	88.0
Outsider ownership, %	10.5	21.8	0	99.9
State monopoly	0.2	0.4	0	1
Regional monopoly	0.1	0.3	0	1
Strategic enterprise	0.3	0.5	0	1
Trade orientation, %	9.8	29.7	0	98.1
Privatization group1	0.1	0.1	0	1
Privatization group 2	0.7	0.5	0	1
Privatization group 3	0.3	0.5	0	1
Leasing firm	0.2	0.4	0	1
Industry characteristics:				
Market concentration:				
Herfindahl−Hirschman Index (HHI)	0.25	0.25	0.02	0.98
Import penetration	0.28	0.27	0.01	0.85
Production output growth in the previous period, %	−5.5	14.8	−68.9	109.5
Privatized firms in the regional production, %	54.8	14.3	15.8	92.6
Privatized firms in the industry production, %	52.5	20.7	4.6	86.1
Privatized firms in the regional employment, %	24.9	5.3	10.8	36.6
Privatized firms in the industry employment, %	50.8	20.1	3.1	83.1

Source: Data on firm production inputs, performance and ownership is from the Center of Public Information of the Ukrainian State Committee on Securities and Stock Exchange. The State Property Fund of Ukraine provides data on the state, regional monopoly and strategic enterprise status; proportion of the region and industry output produced by privatized firms, privatization group. Data on market concentration is provided by the Institute of Economic Research and Policy Consulting. Macroeconomic indicators are from the Ukrainian State Committee of Statistics and National Bank of Ukraine.

Cobb–Douglass production function, the general estimation function of performance on production inputs and vectors of ownership, market and firm-specific characteristics, can be written as follows:

$$\text{Log}Y_{it} = \beta_0 \text{Log}L_{it} + \beta_1 \text{Log}K_{it} + \sum_n \beta_n OWNERSHIP_{it} +$$

$$+ \sum_m \beta_m MARKET_{it} + \sum_k \beta_k FIRM\_CONTROLS_i + u_{it}, \qquad (1)$$

where i indexes firms, t periods and the β are the estimation parameters. Definition of all variables for the analysis is given in Table 10.

Table 10. Variable Description.

Variable	Definition
Outcomes:	
Sales revenue (thousands 1995 hryvnyas)	Gross annual revenues, deflated using industry price indexes.
Output (thousands 1995 hryvnyas)	Gross annual output, deflated using industry price indexes.
Explanatory variables:	
Firm characteristics:	
Number of employees	Annual average number of employees.
Net capital stock (in thousands of 1995 hryvnyas)	Real capital stock net of depreciation; deflated using machinery & equipment price index.
Private ownership, %	Sum of all private shares.
Privatization	One if private ownership >50%.
Concentrated ownership, %	Sum of private stakes above 25% each.
Dispersed private ownership, %	Sum of private shares below 25% each.
Insider ownership, %	Sum of outside shareholder shares (above 25% each).
Outsider ownership, %	Sum of insider (management) shares above 25% each.
State monopoly	Firm status of a state monopoly defined by the Ukrainian Antimonopoly Committee.
Regional monopoly	Firm status of a regional monopoly defined by the Ukrainian Antimonopoly Committee.
Strategic enterprise	Firm status of a strategic enterprise defined by the Ukrainian Cabinet of Ministers.
Trade orientation	Share of firm sales on export.

Variable	Definition
Explanatory variables:	
Firm characteristics:	
Privatization group by Ukraine's privatization program (1−3)	Dichotomous variables group1−3: 1 — small firms, 2 — med- and large-size firms, 3 — strategic firms & monopolies.
Leasing firm	Leasing firm on the moment of firm privatization.
Industry (13 sectors)	Industry dummies (two-digit disaggregation).
Location (4 regions)	Region dummies (east, west, north & south)
Industry characteristics:	
Market concentration: Herfindahl-Hirschman Index (HHI)	Sum of the squared market shares of all producers in a disaggregated four-digit industry, divided by 10,000.
Import penetration	Proportion of the value of imported goods in the market.
Industry production growth in the previous period, %	Growth of production output in industry, by three-digit industry classification.
Privatized firms in the industry (region) production output.	Share of the industry (region) output produced by privatized firms.
Privatized firms in the industry (region) employment.	Share of privatized firms in the industry (region) employment.
Time effects	Year dummies (1996−2000).

The vector of ownership variables is threefold.[5] The first distinction is between state and non-state (privatized) firms. The benchmark for state ownership is the 50% + 1 share, or the controlling stake, held by government. Under the assumption that large shareholders, including the state, do not behave passively, this selection makes sense. A firm with mixed private-state ownership but the controlling share belonging to the government may perform similarly to firms with full state ownership. The hypothesis for study is that privatization — by providing more effective incentive structure and corporate governance — improves firm efficiency. The estimation model for this analysis takes on the following form where

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[5] Due to a negligible share of foreign ownership in Ukraine (0.1% in 1998), it is not considered separately.

Privatized assumes either an indicator variable (more than 50% is private) in (2) or a continuous variable (sum of all private shares) in (3)

$$\text{Log}Y_{it} = \beta_0\text{Log}L_{it} + \beta_1\text{Log}K_{it} + \beta_2 PRIVATIZED_{it} +$$
$$+ \sum_m \beta_m MARKET_{it} + \sum_k \beta_k FIRM\_CONTROLS_i + u_{it}, \qquad (2)$$

$$\text{Log}Y_{it} = \beta_0\text{Log}L_{it} + \beta_1\text{Log}K_{it} + \beta_2 PRIVATIZED\_SHARE_{it} +$$
$$+ \sum_m \beta_m MARKET_{it} + \sum_k \beta_k FIRM\_CONTROLS_i + u_{it}. \qquad (3)$$

Another distinction is associated with separating ownership from control. In other words, private firms are distinguished by their ownership concentration. Here firms are divided into those that are widely held, *i.e.* those with a dispersed ownership structure, and those with relatively few large owners, with a concentrated ownership structure. The benchmark to decide if an owner is sufficiently large to create ownership concentration is a 25% + 1 stake (the blockholding share). The presumption is that concentrated shareholding addresses the need for a mechanism to protect investors from managerial expropriation and resolves the principal-agent problem more effectively than dispersed ownership structures. Effective corporate governance of a firm leads to better firm performance. The relevant regression assumes the form where the variable for private concentrated shareholding is *Concentrated Share* (sum of private shares over 25%) and *Dispersed Share* (sum of private shares below 25%) represents dispersed ownership structures.

$$\text{Log}Y_{it} = \beta_0\text{Log}L_{it} + \beta_1\text{Log}K_{it} + \beta_2 CONCENTRATED\_SHARE_{it} +$$
$$+ \beta_3 DISPERSED\_SHARE_{it} + \sum_m \beta_m MARKET_{it} +$$
$$+ \sum_k \beta_k FIRM\_CONTROLS_i + u_{it}. \qquad (4)$$

The final distinction is insider- *vs.* outsider-dominant ownership. As discussed above, the availability of data on owners with shares above 5% restricts the study of insider-outsider ownership to concentrated structures. Given the instrumental role that managers play in many Ukrainian firms (due to inherent from the Soviet era "paternalistic" image, connections and inside information), I expect a significant difference in performance of manager-owned firms and firms with shareholding concentrated by outsiders. The respective model includes variables for insider ownership *Insider Share* (sum of managerial shares over 25%), outsider ownership *Outsider Share* (sum of stock over 25% held by outsiders), and dispersed ownership

Dispersed Share (sum of private shares below 25%).

$$\text{Log}Y_{it} = \beta_0 \text{Log}L_{it} + \beta_1 \text{Log}K_{it} + \beta_2 INSIDER\_SHARE_{it} +$$
$$+ \beta_3 OUTSIDER\_SHARE_{it} + \beta_4 DISPERSED\_SHATE_{it} +$$
$$+ \sum_m \beta_m MARKET_{it} + \sum_k \beta_k FIRM\_CONTROLS_i + u_{it}. \qquad (5)$$

I try to incorporate the impact of market environment by including the variables for market structure and import penetration. As an indicator of market structure, I adopt a commonly used measure of market concentration, the Herfindahl−Hirschman index (HHI) calculated for four-digit industries. Following Brown and Earle (2000b), I assume an exogenous market structure in Ukraine. Since the onset of transition and given the speed of reform, the period of market formation was probably too short to induce endogeneity of the market structure. It is unlikely that fluctuations in firm profits gave rise to significant changes in the concentration of market power in some markets. A more realistic assumption for Ukraine is that its industry structures have not changed much from what has been inherent from the Soviet period. Therefore, for Ukraine's transition economy the probability of the market structure endogeneity is relatively low. Because the HHI accounts only for domestic competition, I include a measure for additional market pressure, induced by foreign competitors. Import penetration is the share of imported goods and services in the value of products in every industry.

Firm-specific controls include time-invariant factors that may correlate with firm performance. These are indicators of the state and regional monopoly, strategic enterprise, privatization group (Law of Ukraine on the State Privatization Program), industry, location and trade orientation (the share of exports in total production). I include time effects, as the transition environment fluctuations over time may be influential in Ukraine.

In light of the above discussion of a three-dimension ownership vector, I estimate several model specifications starting with the one that includes privatization as an indicator variable (2), following with the one of total private shares (3), the sums of concentrated and dispersed private shares (4), and finally distinguishing between private large inside and outside shareholders and small shareholders (5). State ownership is therefore always a benchmark for comparison.

To test the robustness of the estimation results, both for ownership and for market structure effects, I estimate alternative specifications of the basic model. It is possible that the effect of market competition is sensitive to the inclusion of firms from regulated industries, *e.g.* energy sec-

tor. Similarly, the effect of ownership might be dependent on the firms being monopolies or strategic enterprises, as these firms have different from average performance (Table 11). In additional specifications, I consider industry specific (linear) time trends assuming there were systematic patterns in variation across industry trends that would significantly affect firm performance and would not be captured in industry and time fixed effects.

Table 11. Annual Revenue Growth by Firm Ownership and Monopoly Status.

	All firms	Non-strategic enterprises or monopoly firms	Strategic enterprises or monopoly firms
Total number of firms	1211	744	467
All firms	3.3%	2.0%	5.3%
Majority state owned	4.4%	−11.1%	18.4%
Majority private dispersed	0.8%	−1.5%	3.9%
Majority private concentrated	8.3%	8.8%	7.2%

Source: Sample Database.

The model estimation raises several econometric problems. The biggest challenge is the specification problem: selection of variables in a model and the relation between these variables and omitted but important factors for the outcome variable. If this relation exists, not accounting explicitly for the omitted variables (due to data unavailability or specification error) will reflect their effects in a model through the error term. Technically, the orthodonality assumption will be violated, and the estimates will be biased. As the discussion above emphasized, we cannot observe and implicitly control for all factors correlated with ownership and firm performance (*e.g.* the firm true "value"). Hence, it is essential to beware of the danger of using OLS and adopt techniques that are more appropriate.

Furthermore, proceeding with the estimation that postulates the identical (i.i.d.) distribution of the residuals across observations is not verified for panel data. Multiple observations on the same units give autocorrelated error terms and these error terms are unlikely to have constant variance. To obtain optimal variance minimizing estimators, the clustering estimation options and generalized least squares (GLS) analysis are used.

To address the specification problem, I combine several procedures. I first pool the data and apply the IV (2SLS) estimation procedure to the performance model with instrumented ownership. I use this technique for the pooled clustered data and cross-section data in year 2000. I then estimate the panel data using the Balestra and Varadharajan–Krishnakumar's G2SLS random-effects approach[6]. In postulating conditional distribution of unobserved effects, given observed exogenous variables, the assumption of randomly distributed individual specific terms across firms seems to be more plausible. Assuming constant differences across units, the fixed-effects approach produces results conditional on the units in the sample. The fixed effects model would be therefore appropriate for estimating the sample, which fully represents the underlying population (*e.g.* all countries). The data for this study, however, is drawn of observations from a large population of firms. It represents a small part of the underlying population rather than exhaust it. In this context, if we want to draw inferences on individuals outside the sample, the random-effects approach is more reasonable (Wooldridge, 2002; Greene 2000). Furthermore, postulating fixed differences across firms in the dynamic environment of a transition economy may be debatable. Finally, some truly fixed differences across firms (industry, location) are possible to control in the random-effects estimation with dummies.

I try to instrument endogenous ownership with a set of variables, which highly correlate with ownership and at the same time effect performance only through ownership. These are the proportion of privatized firms in the regional and industry production and employment, industry growth in the past period and the leased firm indicator[7]. Privatization was more likely to happen in the environment where the pace of privatization reform was relatively high. This is to some extent an explicit indicator of whether institutional and political conditions favor privatization (Brown and Earle, 2000a). At the same time, firm performance is unlikely to depend directly on the extent of privatization in the region and/or industry.

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[6] The Breusch–Pagan Lagrange multiplier test for random effects rejects the null hypothesis of Var(v[i]) = 0. The Hausman test results vary depending on the performance indicators and types of ownership with the majority of cases being insignificant. This suggests that random effects may be used in estimation although some caution is desired in interpreting its results.

[7] Both employment and production are used to allow for a broader analysis of the privatization process. Although these measures are related, they may each have captured some specific tendency in the development of privatization in Ukraine and thus their joint effect on ownership may give additional information in predicting endogenous ownership (Table 9).

Similarly, industry growth in the past period is likely to attract investors to these markets but rather unlikely to affect firm efficiency in the next period. By the setup of Ukraine's privatization legislation, leased firms were more likely to be privatized in the first place (via free-of-charge transfer to employees or buyout). However, being a leased firm should not be correlated directly with firm performance.

As often, good instruments are hard to find and they often remain open to question. The best choice of an instrumental variable would be truly random or close to random: distance, price, policy. This is however not feasible. Thus, the assumption that the share of privatized firms in the regional and industry production/employment and industry growth in the previous period, are uncorrelated with firm performance is crucial to the consistency of IV estimates. Technically, the condition postulates $\text{cov}[Z, \varepsilon] = 0$ where Z is an instrument for ownership and ε is an unobserved error term. Contrary to the second requirement for the validity of IV estimates, $\text{cov}[X, Z] \neq 0$, this condition is not testable. It is therefore an a priori assumption for the study that the only way that the chosen IVs affect firm performance is through ownership.

To verify this assumption, I compared firm performance by groups of state-owned and privatized firms and the industry/region privatization shares. The descriptive analysis provides evidence to the assumption that the distribution of firm performance is for practical purposes directly independent of the extent of privatization in the industry and region, and their observable relation is conditional on ownership. Table 12 illustrates that performance outcomes are higher for privatized firms *vs.* state-owned in industries/regions with a larger above average extent of privatization (col. B & C). This is true for all indicators used. At the same time, there are no significant performance differences by the extent of privatization without distinguishing between ownership groups (col. A). Therefore, when we do not control for ownership, there is no relation between performance and the extent of privatization in the industry/region.

These results are supported by the estimates of the first-stage regressions. In all specifications, jointly significant correlations of the instruments with the instrumented ownership confirm the condition of valid instruments $\text{cov}[X, Z] \neq 0$. In the cross-section specification and IV (2SLS) estimation of the pooled data, failure to reject the Davidson−MacKinnon overidentification test further indicates the instruments goodness. This result is however not robust in each specification with the random effects estimators, and thus precludes exclusive reliance on the estimates of these specifications. The insignificant C statistic supports

Table 12. Sample Firms by Ownership and Extent of Privatization in 1996.

	A	B	C
Average labor productivity	11.6	14.1	11.0
Proportion of privatized firms in the industry employment			
Below average	17.3	16.0	17.6
Above average	8.5	12.9	7.5
Proportion of privatized firms in the region employment			
Below average	9.7	10.0	9.6
Above average	12.9	16.0	12.0
Proportion of privatized firms in the industry output			
Below average	15.9	11.6	17.1
Above average	9.2	15.6	7.7
Proportion of privatized firms in the region output			
Below average	12.7	14.7	12.3
Above average	10.9	13.9	10.2
Proportion of privatized firms in the total number firms in the industry			
Below average	13.6	8.0	14.9
Above average	10.9	16.0	9.6
Proportion of privatized firms in the total number of firms in the region			
Below average	11.3	14.8	10.5
Above average	11.9	13.5	11.5

Source: Sample Database. All data entries are in thousand 1995 hryvnyas.

A — All firms; B — Privatized; C — State-owned.

the hypothesis of exogeneity of each included instrument. Furthermore, one may argue that only random instruments will not violate the condition $\mathrm{cov}\left[Z,\varepsilon\right]=0$. Thus, these limitations of the study should be taken into account in interpreting the results.

5. RESULTS

I start the analysis with variables other than those of main concern. The estimated parameters for production inputs are overwhelmingly significant and usually reflect the situation with their use in Ukraine. These are the large estimate of the labor force share (0.6−0.8) and twice lower estimate for capital stock (0.25−0.35). In most cases, the production function estimation shows decreasing returns to scale, which makes sense for the Ukrainian industries under study. Furthermore, the significant positive effects are found for strategic firms and state monopolies. Clearly, these firms accrue rents and therefore tend to develop rent-seeking activities (lobbying, bribes, soft budget constraints). Another significant result is for the privatization group: firms from group 2 tend to under-perform in comparison to firms in the 3-rd privatization group. As Walsh and Whelan (2000), I include trade orientation in the firm attainment regression but its estimates are nowhere significant. Finally, there are important differences by region (southern and western part of Ukraine are negative associated with firm attainment), industry and year.

Table 13 presents selective results from the 1-st stage ownership regressions. The estimates for instrumental variables are jointly significant. As some of them are correlated, the individual significance (t-test) should not be critical in deciding on how well they explain the dependent instrumented variable. Thus, the significant result for leased firms shows higher probability of their privatization. This result fits well the setup of the Ukrainian privatization — preferential buyout or free transfer to insiders of leased firms. Another instrument for ownership, past industry growth, has a significant positive impact on privatization. Clearly, investors come to markets with good prospects of development and high future return. Table 13 also has results of the tests on the validity of instruments (F-test, overidentification test of all instruments, exogeneity of instruments). With this evidence, I proceed to instrument ownership with the chosen instruments. However, the findings should be treated with caution given the insignificant results of overidentification tests (overidxt2) in the panel data estimation.

For cross-section estimation, the complete results for performance regressions are presented in Tables 14−15. The paper reports cross-sectional estimates only for regressions with sales revenue as the dependent variable but similar results are obtained for production output regressions. Tables 16−18 give all estimates of the production function parameters obtained with the G2SLS random-effects estimators. Both sales and output regressions have their estimates reported. Table 19 summarizes random-effects estimates for production inputs, ownership

Table 13. First Stage Ownership Regressions.

Variable	A	B	C	D	E
Proportion of privatized firms in the regional production	6.33* (4.04)	1.38 (2.82)	3.18 (5.26)	2.21 (2.80)	−0.83 (0.69)
Proportion of privatized firms in the industry employment	−30.41 (17.75)	−23.11 (18.51)	−33.56 (34.56)	−18.22 (18.40)	−4.88 (4.51)
Proportion of privatized firms in the industry production	15.32 (17.75)	−1.95 (13.95)	30.66 (26.05)	−3.33 (13.87)	1.38 (3.40)
Leasing firm	15.43** (1.23)	0.99 (0.92)	12.37** (1.72)	0.79 (0.91)	0.19 (0.22)
Past industry growth	0.07* (0.04)	0.04 (0.03)	−0.07 (0.05)	0.04 (0.03)	0.01 (0.01)
F test: Prob > F	0.000	0.092	0.000	0.103	0.150
Sargan statistic (Overidentification test of all instruments) Chi-sq(5) P-val:					
From the 2-nd stage equation being estimated (Model 1−3 for Sales Revenue)	0.14188	0.79182	0.79182	0.59078	0.59078
C statistic (Exogeneity of the specified instrument) Chi-sq(1) P-val:					
Instrument tested:					
— Privatized firms in the regional output	0.59339	0.94034	0.94034	0.97105	0.97105
— Privatized firms in the industry employment	0.96679	0.65443	0.65443	0.58301	0.58301
— Privatized firms in the industry output	0.77214	0.43834	0.43834	0.61214	0.61214
— Leasing firm	0.83375	0.96325	0.96325	0.41593	0.41593
— Past industry growth	0.22288	0.38802	0.40316	0.95435	0.95435
R square	0.423	0.152	0.204	0.137	0.025
Number of observations	3909	3497	3497	3497	3497

Dependent variable is the sum of shares for the ownership category. The performance indicator in the 2-nd stage regression is log(sales). The results from the 1-st stage regressions are reported only for instrumental variables.

White standard errors are in parentheses; * — p- value <0.10; ** — p- value <0.05.

A — Private ownership, Model 1; B — Concentrated private ownership, Model 2; C — Dispersed private ownership, Model 2; D — Ownership concentrated by outsiders, Model 3; E — Ownership concentrated by insiders, Model 3.

and competition in three ownership models. Furthermore, Table 20 gives estimates of ownership effects in the cross-sectional, pooled IV (2SLS) and panel data specifications.

Table 14. Cross-Section IV Estimation for Year 2000. Model 1: Privatization.

Variable	Sales revenue			Production output		
	Estimate	Standard error		Estimate	Standard error	
Intercept	−4.692	2.20	**	−5.104	2.46	**
Labor input, log	0.892	0.09	**	0.874	0.09	**
Capital stock, log	0.323	0.08	**	0.324	0.09	**
State ownership	Reference			Reference		
Private ownership	0.057	0.02	**	0.056	0.02	
State monopoly	0.326	0.18	*	0.274	0.19	
Regional monopoly	−0.066	0.24		−0.185	0.26	
Strategic firm	0.916	0.40	**	0.949	0.42	**
Trade orientation	0.061	0.19		0.041	0.22	
Privatization group 1	−0.214	0.45		−0.203	0.53	
Privatization group 2	−0.448	0.27	*	−0.442	0.32	
Privatization group 3	Reference			Reference		
Market concentration	0.473	0.36		0.445	0.38	
Import penetration	−1.082	0.66	*	−0.939	0.70	
Industry price growth	0.000	0.01		0.000	0.01	
Eastern region	Reference			Reference		
Western region	−0.246	0.16		−0.346	0.17	**
Northern and central region	0.023	0.15		0.048	0.15	
Southern region	−0.073	0.22		−0.086	0.24	
Industry dummies	Yes			Yes		
Centered R-squared	0.432			0.365		
Number of observations	934			934		

Dependent variable is ln(sales) and ln(output). Instruments for ownership: a leasing firm indicator, proportions of privatized firms in industry and region production.

* — p-value <0.10; ** — p-value. <0.05.

Table 15. Cross-Section IV Estimation for Year 2000.

Variable	Model 2: Ownership concentration			Model 3: Insider *vs.* outsider concentrated ownership		
	Estimate	Standard error		Estimate	Standard error	
Intercept	−2.170	2.29		−2.696	1.74	
Labor input, log	1.104	0.46	**	1.196	0.17	**
Capital stock, log	0.109	0.39		0.038	0.16	
State ownership	Reference			Reference		
Dispersed private ownership	0.034	0.02	**	0.031	0.02	*
Concentrated private ownership	0.081	0.11		Not relevant		
Concentrated private ownership by insiders	Not relevant			0.148	0.24	
Concentrated private ownership by outsiders	Not relevant			0.101	0.04	**
State monopoly	0.298	0.48	*	0.401	0.24	*
Regional monopoly	0.336	1.02		0.559	0.39	
Strategic firm	0.534	0.79		0.716	0.34	**
Trade orientation	−0.072	0.42		−0.135	0.28	
Privatization group 1	0.082	0.59		−0.241	0.82	
Privatization group 2	−0.189	0.23		−0.205	0.24	
Privatization group 3	Reference			Reference		
Market concentration	0.403	0.57		0.548	0.41	
Import penetration	−1.215	1.59		−1.449	1.06	
Industry price growth	−0.004	0.01		−0.005	0.01	
Eastern region	Reference			Reference		
Western region	−0.412	0.20	**	−0.418	0.24	*
Northern and central region	0.022	0.16		0.049	0.18	
Southern region	−0.389	0.24	*	−0.334	0.27	
Industry dummies	Yes			Yes		
Centered R-squared	0.469			0.172		
Number of observations	934			934		

Dependent variable is ln (sales). Instruments for ownership variables: a leasing firm indicator, proportion of privatized firms in the industry and regional output.

* — p-value <0.10; ** — p-value <0.05.

Table 16. Random Effects G2SLS Estimation: Privatization. Model 1.

Variable	Sales revenue			Production output		
	Estimate	Standard error		Estimate	Standard error	
Intercept	1.23	0.49	**	0.42	0.40	
Labor input, log	0.62	0.03	**	0.85	0.03	**
Capital stock, log	0.31	0.03	**	0.21	0.03	**
State ownership	Reference			Reference		
Private ownership	0.02	0.005	**	0.02	0.003	**
State monopoly	0.42	0.09	**	0.32	0.07	**
Regional monopoly	−0.09	0.14		−0.17	0.10	*
Strategic firm	0.28	0.11	**	0.33	0.08	**
Trade orientation	0.09	0.11		0.19	0.08	**
Privatization group 1	−0.42	0.28		−0.18	0.21	
Privatization group 2	−0.32	0.13	**	−0.27	0.09	**
Privatization group 3	Reference			Reference		
Market concentration	−0.11	0.15		−0.06	0.12	
Import penetration	−0.41	0.21	*	−0.10	0.19	
Past industry price growth	−0.003	0.001	**	−0.01	0.001	**
Eastern region	Reference			Reference		
Western region	−0.29	0.08	**	−0.36	0.06	**
Northern and central region	0.05	0.07		0.01	0.05	
Southern region	−0.26	0.10	**	−0.24	0.08	**
Year 1996	0.58	0.28	**	0.84	0.21	**
Year 1997	0.13	0.15		0.27	0.13	**
Year 1998	0.02	0.09		0.04	0.08	
Year 1999	−0.12	0.04	**	−0.06	0.06	
Year 2000	Reference			Reference		
Industry dummies	Yes			Yes		
R-squared	0.729			0.659		
Number of observations	3909			3909		

Dependent variable is ln(sales) and ln(output). Instruments: proportion of privatized firms in the regional production, industry production and employment, leasing firm, past industry growth.

* — p-value <0.10; ** — p-value <0.05.

Table 17. Random Effects G2SLS Estimation: Ownership Concentration. Model 2.

Variable	Sales revenue			Production output		
	Estimate	Standard error		Estimate	Standard error	
Intercept	1.20	0.58	**	0.37		
Labor input, log	0.66	0.04	**	0.82	0.07	**
Capital stock, log	0.26	0.03	**	0.19	0.05	**
State ownership	Reference			Reference		
Private dispersed ownership	0.01	0.01	**	0.01	0.01	**
Concentrated ownership	0.04	0.02	**	0.05	0.02	**
State monopoly	0.49	0.13	**	0.49	0.15	**
Regional monopoly	0.08	0.18		0.02	0.19	
Strategic firm	0.38	0.17	**	0.54	0.22	**
Trade orientation	0.07	0.13		0.13	0.14	
Privatization group 1	−0.37	0.33		−0.20	0.35	
Privatization group 2	−0.20	0.13	*	−0.15	0.13	
Privatization group 3	Reference			Reference		
Market concentration	0.01	0.18		0.01	0.21	
Import penetration	−0.47	0.25	*	−0.34	0.30	
Past industry price growth	−0.004	0.001	**	−0.01	0.002	**
Eastern region	Reference			Reference		
Western region	−0.28	0.10	**	−0.33	0.11	**
Northern and central region	0.08	0.09		0.04	0.09	
Southern region	−0.26	0.12	**	−0.24	0.13	*
Year 1996	0.89	0.41	**	1.29	0.51	**
Year 1997	0.61	0.32	*	0.79	0.41	*
Year 1998	0.19	0.19		0.24	0.27	
Year 1999	0.07	0.17		0.24	0.25	
Year 2000	Reference			Reference		
Industry dummies	Yes			Yes		
R-squared	0.707			0.607		
Number of observations	3497			3497		

Dependent variable is ln(sales) and ln(output). Instruments: proportion of privatized firms in the regional production, industry production and employment, leasing firm, past industry growth.

* — p-value <0.10; ** — p-value <0.05.

Table 18. Random Effects G2SLS Estimation: Insider *vs.* Outsider Concentrated Ownership. Model 3.

Variable	Sales revenue			Production output		
	Estimate	Standard error		Estimate	Standard error	
Intercept	1.60	0.94	*	0.57	0.77	
Labor input, log	0.59	0.05	**	0.76	0.07	**
Capital stock, log	0.29	0.07	**	0.22	0.05	**
State ownership	Reference			Reference		
Private dispersed ownership	0.01	0.01	*	0.01	0.01	*
Large outsider shareholding	0.04	0.02	*	0.05	0.03	*
Large insider shareholding	−0.004	0.15		0.05	0.19	
State monopoly	0.52	0.16	**	0.51	0.15	**
Regional monopoly	0.06	0.24		0.01	0.21	
Strategic firm	0.38	0.19	**	0.52	0.23	**
Trade orientation	0.07	0.18	**	0.14	0.16	
Privatization group 1	−0.43	0.42		−0.24	0.38	
Privatization group 2	−0.19	0.19		−0.16	0.15	
Privatization group 3	Reference			Reference		
Market concentration	0.09	0.29		−0.01	0.23	
Import penetration	−0.56	0.45		−0.39	0.42	
Past industry price growth	−0.004	0.002	**	−0.01	0.002	**
Eastern region	Reference			Reference		
Western region	−0.23	0.13	*	−0.31	0.12	**
Northern and central region	0.09	0.12		0.05	0.11	
Southern region	−0.26	0.16	*	−0.24	0.15	
Year 1996	0.75	0.45	*	1.23	0.54	**
Year 1997	0.49	0.34		0.73	0.43	*
Year 1998	0.14	0.19		0.21	0.27	
Year 1999	0.02	0.17		0.22	0.24	
Year 2000	Reference			Reference		
Industry dummies	Yes			Yes		
R-squared overall	0.701			0.615		
Number of observations	3497			3497		

Dependent variable is ln(sales) and ln(output). Instruments: proportion of privatized firms in the regional production, industry production and employment, leasing firm, past industry growth.

* — p-value <0.10; ** — p-value <0.05.

Table 19. Random Effects G2SLS Estimation: Comparative Selective Estimates. All Models.

Variable	Sales Revenue			Production Output		
	Estimate	Standard error		Estimate	Standard error	
State ownership	Reference category in all models					
Privatization dummy	1.85	0.44	**	2.17	0.39	**
Market concentration	−0.12	0.15		0.01	0.13	
Import penetration	−0.39	0.22	*	−0.08	0.21	
Labor input, log	0.71	0.03	**	0.87	0.03	**
Capital stock, log	0.29	0.03	**	0.21	0.03	**
R square	0.677			0.600		
Privatization share	0.02	0.004	**	0.02	0.003	**
Market concentration	−0.11	0.15		−0.06	0.12	
Import penetration	−0.41	0.21	*	−0.10	0.19	
Labor input, log	0.62	0.03	**	0.85	0.03	**
Capital stock, log	0.31	0.03	**	0.21	0.03	**
R square	0.729			0.659		
Number of observations: 3,909						
Concentrated ownership	0.04	0.02	**	0.05	0.02	**
Dispersed ownership	0.01	0.01	**	0.01	0.01	**
Market concentration	0.01	0.19		0.01	0.21	
Import penetration	−0.47	0.25	*	−0.34	0.30	
Labor input, log	0.66	0.04	**	0.82	0.07	**
Capital stock, log	0.26	0.03	**	0.19	0.05	**
R square	0.707			0.607		
Concentrated by outsiders	0.04	0.02	*	0.05	0.03	*
Concentrated by insiders	−0.004	0.16		0.05	0.19	
Dispersed ownership	0.01	0.01	*	0.01	0.01	*
Market concentration	0.09	0.29		−0.003	0.23	
Import penetration	−0.56	0.45		−0.39	0.42	
Labor input, log	0.59	0.05	**	0.76	0.07	**
Capital stock, log	0.29	0.07	**	0.22	0.05	**
R square	0.701			0.615		
Number of observations	3497			3497		

Dependent variable is ln(sales) and ln(output). All model specifications include firm specific controls, year dummies and industry specific effects.

* — p-value <0.10; ** — p-value <0.05.

Table 20. Sensitivity of Ownership and Market Competition Estimates to Alternative Specifications.

Variable	A	B	C
State ownership	Reference group in all specifications		
Privatization dummy	7.12* (3.99)	2.05** (0.49)	1.85** (0.44)
Market concentration	0.87 (0.71)	−0.08 (0.17)	−0.12 (0.15)
R square	0.374	0.649	0.677
Privatization share	0.06** (0.02)	0.02** (0.004)	0.02** (0.01)
Market concentration	0.47 (0.35)	−0.10 (0.15)	−0.11 (0.15)
R square	0.432	0.717	0.729
Concentrated ownership	0.08 (0.11)	0.04** (0.02)	0.04** (0.02)
Dispersed ownership	0.03** (0.02)	0.02** (0.01)	0.01** (0.01)
Market concentration	0.40 (0.57)	−0.02 (0.16)	0.01 (0.19)
R square	0.468	0.700	0.707
Outside blockholder	0.10** (0.04)	0.04* (0.02)	0.04* (0.02)
Inside blockholder	0.15 (0.24)	0.05 (0.17)	−0.004 (0.16)
Dispersed ownership	0.03* (0.02)	0.02** (0.01)	0.01* (0.01)
Market concentration	0.55 (0.41)	−0.02 (0.16)	0.09 (0.29)
R square	0.172	0.702	0.701
Number of observations	934	3947	3947

Variable	D	E	F
State ownership	Reference group in all specifications		
Privatization dummy	1.25** (0.44)	1.74** (0.42)	0.99** (0.42)
Market concentration	−0.21 (0.15)	−0.26* (0.16)	−0.11 (0.14)
R square	0.637	0.658	0.736
Privatization share	0.01** (0.004)	0.01** (0.005)	0.01** (0.004)
Market concentration	−0.23 (0.16)	−0.27 (0.18)	−0.11 (0.14)
R square	0.656	0.707	0.749
Concentrated ownership	0.04* (0.03)	0.04** (0.01)	0.03* (0.03)
Dispersed ownership	0.01 (0.01)	0.01** (0.01)	0.01 (0.01)
Market concentration	−0.09 (0.24)	−0.22 (0.20)	−0.01 (0.20)
R square	0.551	0.681	0.732
Outside blockholder	0.04 (0.03)	0.04** (0.02)	0.02 (0.03)
Inside blockholder	0.02 (0.12)	−0.02 (0.16)	−0.13 (0.19)
Dispersed ownership	0.01 (0.01)	0.01* (0.01)	0.01 (0.01)
Market concentration	−0.09 (0.24)	−0.12 (0.27)	0.06 (0.30)
R square	0.543	0.644	0.644
Number of observations	2238	2776	3497

All table entries are coefficients on ownership categories and market competition parameters from individual regressions. The dependent variable in each case is ln(sales). All model specifications include firm specific controls, year dummies and industry specific effects.

White standard errors are in parentheses for 2SLS specifications. Standard errors are for G2SLS specifications. * — p-value <0.10; ** — p- value <0.05.

A — 2SLS for year 2000; B — 2SLS for pooled years, by clustered; C — G2SLS random-effects; D — G2SLS random-effects without strategic enterprises; E — G2SLS random-effects without state monopolies; F — G2SLS random-effects with industry specific trends.

In all specifications, the effect of privatization is overwhelmingly positive. The estimates of the indicator and continuous privatization variables are significant at 5% level and robust to changes in the specification and sample. The difference is large: a percentage point increase in private ownership implies on average 2% higher productivity per year[8]. These growth rates, therefore, evidence to the important beneficial role of private ownership and the incentives it provides.

The estimation of regressions that include ownership variables for different types of private shareholding also finds a significant and positive effect of private ownership. The parameter magnitude is however greater for firms with concentrated private ownership, which in the random effects specification is 0.03-point difference over firms with diluted ownership and 0.02-point difference in the pooled data IV specification. Saying differently, annual productivity growth for firms with concentrated ownership is on average 2−3% higher than for other private firms and 4% larger that for state-owned firms. These results confirm economic theory. Concentrated shareholding deals better with establishing an appropriate mechanism of corporate governance and resolving the agency problem. This effectiveness inevitably reflects in better firm performance. One caveat is however present in the findings. The cross-section estimation finds a significant positive effect for dispersed ownership but not for concentrated shareholding. This result is however less likely to represent the true effect of ownership concentration. When prior firm attainment is taken into account and changes in performance are evaluated, the effect of shareholding concentration is significantly positive and stable across the model specifications.

Outsider-concentrated ownership has a significant and large positive impact on firm performance. In the cross-sectional specification, the estimated parameters are significant at 5% level and show 0.07-point marginal difference in the performance of outsider-concentrated firms over firms with dispersed private ownership and 0.10-point difference over state-owned firms. The random effects and pooled data IV estimations give similarly positive but smaller marginal effects of outsider-concentrated ownership and at 10% significance level. The marginal difference is respectively 0.02 and 0.04-point. For insider-dominated ownership, no significant impact is found in any specification. Therefore, firms with dominant outside shareholders perform

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[8] Clearly, ownership growth has 100% limit, and may also have important nonlinear marginal effects on performance, *e.g.* the 50%-benchmark. The nonmonotonic relation between ownership and firm performance presents a topic for further research.

best — the result we would expect based on the corporate govern-
ance theory.

The findings on the effect of market competition are not strong. The es-
timates of market competitiveness are statistically insignificant in virtually
all specifications. There are several exceptions of its significant effect at
10% level in the cases when subsets of the sample are estimated. For
the sample that separately drops state monopolies, oil- and chemical-
processing firms, machinery and metal-building companies, the random
effects estimators find a negative association between market concen-
tration and firm sales in the model of privatization (Tables 20, 21). These
results, however, disappear when several ownership variables are used
in estimation (4; 5).

Table 21. Sensitivity of Ownership and Market Competition Estimates to Alterna-
tive Specifications: Industry Factor.

Variable	A	B	C	D	E
State ownership	Reference group in all specifications				
Privatization dummy	1.85** (0.44)	1.66** (0.46)	1.67** (0.43)	2.00** (0.48)	1.72** (0.49)
Market concentration	−0.12 (0.15)	−0.08 (0.16)	−0.09 (0.15)	−0.18 (0.15)	−0.49* (0.23)
Import penetration	−0.39* (0.22)	−0.12 (0.27)	−0.44** (0.22)	−0.83** (0.26)	−0.39* (0.24)
Privatization share	0.02** (0.005)	0.02** (0.004)	0.01** (0.004)	0.02** (0.004)	0.01** (0.005)
Market concentration	−0.11 (0.15)	−0.12 (0.15)	−0.12 (0.13)	−0.23* (0.13)	−0.47* (0.23)
Import penetration	−0.41* (0.21)	−0.26 (0.24)	−0.42** (0.19)	−0.77** (0.22)	−0.38* (0.23)
Concentrated ownership	0.04** (0.02)	0.05** (0.03)	0.02 (0.02)	0.04** (0.02)	0.02** (0.01)
Dispersed ownership	0.01** (0.01)	0.01** (0.01)	0.01* (0.004)	0.01** (0.01)	0.02** (0.01)
Market concentration	0.01 (0.19)	0.07 (0.23)	−0.08 (0.19)	−0.08 (0.19)	−0.39 (0.25)
Import penetration	−0.47* (0.25)	0.03 (0.37)	−0.49** (0.25)	−0.89** (0.29	−0.37 (0.25)

Variable	A	B	C	D	E
Outside blockholder	0.04* (0.02)	0.05* (0.03)	0.02 (0.03)	0.04 (0.03)	0.02 (0.02)
Inside blockholder	−0.004 (0.16)	0.02 (0.15)	0.04 (0.13)	−0.02 (0.18)	0.11 (0.17)
Dispersed ownership	0.01* (0.01)	0.01* (0.01)	0.01** (0.004)	0.01* (0.01)	0.02** (0.01)
Market concentration	0.09 (0.29)	0.14 (0.31)	−0.08 (0.17)	0.02 (0.34)	−0.37 (0.37)
Import penetration	−0.56 (0.45)	−0.01 (0.48)	−0.44 (0.29)	−0.96 (0.65)	−0.22 (0.31)
Number of observations	3497	3319	3241	3340	2459

All table entries are coefficients on ownership categories, market domestic and foreign competition parameters from separate regressions. The dependent variable in each case is ln(sales). All model specifications include firm specific controls, year dummies, and industry specific effects. Standard errors are in parentheses.

* — p-value <0.10; ** — p-value <0.05.

A — All sample; B — Without energy sector; C — Without metallurgy; D — Without oil and chemical processing; E — Without machinery and metal-building.

The results on the effect of import penetration — or foreign competition — are more stable but still inconclusive. The significant at 10% level negative estimates of import penetration effects are shown in several model specifications and mainly in the revenue regressions. For example, the cross-sectional estimation finds a significant effect for foreign competition only when the outcome variable is firm revenue. Similarly, the random effects estimation gives a significant negative impact of import penetration in the sales regression only and not across all model specifications. Failure to find conclusive evidence on the significant role of market structure may be explained by two factors. Competition is a recent phenomenon in Ukraine, and its effects might not be observable in the data yet. Another issue is methodological and relates to the use of alternative measures of market competition, for example, to model a non-monotonic relation between competition and firm attainment.

I check the robustness of ownership and market competition results in various contexts (Tables 20, 21). I instrument the ownership variables and apply IV (2SLS) procedure to estimate the cross-section data in 2000 and to the pooled clustered data. The results mostly correspond to those obtained with the G2SLS random-effects estimation. I further check the sensitivity of ownership and market structure estimates to

changes in the model specifications. I estimate separate regressions for each case without strategic enterprises, state monopolies[9], regulated industries and industries where the government interference is relatively high. For Ukraine, these industries are mainly energy sector, metallurgy and oil-processing. I add industry specific (linear) trends to see if there are industry-specific trends that may affect the ownership and market competition results. In general, the sensitivity analysis gives estimates similar to those of the main specification. Estimation of the sample without strategic enterprises, as well as the sample without state monopolies, gives 0.01-point lower estimates of the privatization effect. Adding industry trends does not change the main estimation results.

Finally, Table 21 presents the estimation results when specific industries were excluded. The estimates point to similar conclusions made for the complete sample. However, several distinctions may be worth mentioning. First, dropping firms from the oil- and chemical-processing sector, as well as machinery and metal-building, gives different results for the effects of market concentration. The coefficients are negative and significant at 10% level in the specification with the aggregate privatization share and at 5% level in the specification of concentrated and dispersed ownership variables. Compared to the basic specification, the estimates of the privatization effects are 0.01-point lower for the sample without metallurgic and machine-building firms. The ownership concentration effect is 0.01-point larger for the sample without energy firms over the estimates for the whole sample. These findings indicate important industry differences in the shareholding structure and firm performance in Ukraine.

6. CONCLUSION

In this study, I attempt to shed light on the causes of post-reform differences in the performance of Ukrainian firms. Within the "big" question agenda on determinants of firm performance in Ukraine, I focus on the effects of the two main post-Soviet economic reforms — privatization and market competition.

The findings are threefold. First, the study provides evidence for Ukraine that firm performance improves with privatization. More efficient performance of privatized firms is found in the analysis, which corrects for nonrandom sequencing of firms to privatization and various (therefore endogenous) ownership structures. Second, the positive effect of privati-

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[9] The number of regional but non-state monopolies is low to change the results.

zation is particularly strong when several private owners concentrate ownership. There is some indication that privatized firms with significant outside shareholders are most efficient. Another finding is that market competition has virtually no role in determining firm performance in Ukraine.

This study provides two contributions for public policymaking. Methodologically, it applies a combination of instrumental variables and random effects to control for biases in the estimation of causal effects when random assignment is not feasible. The endogenous ownership structure is instrumented to account for unobservable biases in the privatization process. Time and firm specific controls capture the effects of general economic trends and time-invariant differences across firms. Applying this methodological approach, the study estimates the effects of the crucial transition reforms drawing from panel data on 1,211 medium and large-size industrial Ukrainian firms for the five-year period.

Substantively, the study finds politically important evidence to the beneficial impact of privatization for Ukrainian firms. It indicates the critical role of establishing an effective mechanism of corporate governance, which shareholding with large owners assures best. The message for privatization policymaking therefore is that the effectiveness of the corporate governance mechanism determines the ultimate success of privatization in bringing efficiency gains. Failure to establish such a mechanism, added to incomplete market institutions, will yield results different from those expected. Therefore, ownership transformation should be followed by radical reforms in the governance of a firm, which concentrated shareholding implements most effectively.

Knowing about the critical role of effective corporate governance should help the government make better privatisation policy choices. Thus, of the possible privatization methods, sales of large stock at commercial tenders and shares distribution at stock exchanges are the two recommended alternatives. Privatization policy, which orients at strategic large investors, capable of pushing restructuring and bringing investment to newly-privatized firms, should become a priority for Ukrainian authorities. Instituting privatization under efficiency rather than distribution objectives would help Ukrainian firms to operate more efficiently, to raise budget revenues, and finally to speed transition to a market economy.

The finding on the insignificant effect of market competition in Ukraine's transition environment suggests important need for further market reform. Large political effort is required to ensure that Ukraine is moving towards competitive market and efficiency gains for the public benefit.

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