

# ARE OLIGARCHS PRODUCTIVE? THEORY AND EVIDENCE

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## ABSTRACT

This paper develops a partial equilibrium model to account for stylized facts about the behavior of oligarchs, politically and economically strong conglomerates in transition and developing countries. The model predicts that oligarchs are more likely than other owners to invest in productivity enhancing projects and to vertically integrate firms to capture the gains from possible synergies and, thus, oligarchs can be socially beneficial. Using a unique dataset comprising almost 2,000 Ukrainian open joint stock companies, the paper tests empirical implications of the model. In contrast to commonly held views, econometric results suggest that, after controlling for endogeneity of ownership, oligarchs tend to improve the performance of the firms they own relative to other firms.

JEL classification: C21, C25, D24, O17, P26, P31

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## I. INTRODUCTION

Since the seminal papers by Ronald Coase (1937, 1960) property rights have been taken seriously in economics. Literally thousands of papers have been written to investigate the effects of property rights allocation on economic outcomes with most empirical research using data from developed economies. Yet it is the transition economies that provide the clearest picture of why and how property rights can affect economic outcomes. Their unique natural experiment highlights how patterns of property rights evolve from the inefficient forms inherited from the communist past to the more efficient forms induced by the market and reveals which forms are the most efficient and viable. Indeed, the literature devoted to analyzing and quantifying the impact of property rights allocation and security on the behavior and performance of enterprises in transition and emerging market economies has grown considerably over the last several years.<sup>1</sup>

In this paper, we show how ownership affects enterprise performance, focusing on how oligarchs—the politically and economically strong conglomerates—affect the firms they own. It is commonly believed that enterprises captured by oligarchs tend to perform poorly (e.g., Stiglitz 1999, Black and Tarassova 2002, Hoffman 2003). We examine this widely shared belief and show both empirically and theoretically that the presence of oligarchs can enhance the relative performance of enterprises.

We show in a theoretical model that the evolution of property rights allocation towards integrated conglomerates led by oligarchs is not necessarily bad. Specifically, our theoretical results suggest that under certain conditions oligarchs have incentives to improve productivity of the firms they own. We argue that oligarchs could have reduced the adverse effects of disorganization in the middle stages of the transition by reintegrating production chains to their market efficient levels and, thus, formation of strong business groups controlled by oligarchs could have contributed to economic recovery in Ukraine and other transition countries. Furthermore, our model explains key stylized facts

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<sup>1</sup> See, for example, Frydman et al (1999), Khanna and Rivkin (2001), Johnson, McMillan, and Woodruff (2002), Kocenda and Svejnar (2003), Samphantharak (2003), and Guriev and Rachinsky (2005) who examine effects of property rights on performance. References to other noteworthy relevant works can be found in Djankov and Murrell (2002).

about the behavior of oligarchs. We thereby show that these behavioral patterns are rational optimizing choices of oligarchs.

Our empirical results, based on a sample of almost 2,000 Ukrainian open joint stock companies, suggest that oligarchs tend to improve the relative performance of the enterprises they own. Importantly, in contrast to previous studies of business groups, we control for endogeneity of firm ownership. Our findings have important policy implications for Ukraine and other countries with similar institutions (e.g., Russia and the Central Asian Republics) or similar organization of property rights (e.g., South East Asian and Latin American countries with highly concentrated economic and political power).

We start the paper with a brief description of the theoretical model. Next we present our main theoretical results and show how they fit into the literature and the experience of transition countries. In Section 3, we discuss our data and present an empirical test of the model. We present conclusions in Section 4.

## **II. HOW CAN OLIGARCHS BE PRODUCTIVE?**

### **Preview**

In a series of influential papers, Grossman, Hart and Moore (Grossman and Hart 1986, Hart and Moore 1990, Hart 1995; henceforth GHM) show that the allocation of property rights matters critically for economic performance of firms in a world of incomplete contracts and asymmetric information. Property rights are particularly important for firms that interact systematically with their counterparts up or down the production chain.

In many industries, this interaction results in a short list of trusted long-term partners as it allows all the parties along the chain to lower transaction costs associated with producing and marketing the product by minimizing search costs, quality control expenses, warranties, etc. Moreover, direct production costs can be lowered, as firms invest in relationship-specific physical and human capital (see Hart 1995, de Meza and Lockwood 1998) without taking a considerable risk of being “help up” — i.e., more certainty implies less cost. As pointed out by Klein, Crawford, and

Alchian (1978), such relationships offer a potentially beneficial opportunity for vertical integration of the whole production chain under a single owner's umbrella.<sup>2</sup>

If firms do not have the political and economic resources to integrate downstream or upstream firms,<sup>3</sup> it is only third parties endowed with sufficient power and resources that can integrate firms along a production chain into a conglomerate when this is warranted by the GMH argument. Oligarchs, formed in Russia, Ukraine and other transition economies in the mid-1990s,<sup>4</sup> clearly had the resources to overcome the various barriers to integration of production chains and to convert potential integration synergies into profits (e.g., enforce contracts). Once firms are integrated, they achieve higher efficiency because oligarchs have the incentive to make relation-specific investments that generate surpluses not available in the absence of integration. The distribution of the surplus can be, however, highly uneven. Oligarchs can expropriate a disproportionately large share at the expense of other parties, such as employees and the government. Looting of firms, which gives such bad press to oligarchs, is one of the channels through which this expropriation can happen.

Note that the GHM model is a very broad framework that nests other competing explanations of why firms controlled by oligarchs may outperform firms with other owners. For instance, improved coordination, appointment of better managers, better access to external finance, allocation of political capital, and mobility of resources within oligarchic groups—to name a few—can be easily rationalized by the GHM approach. Therefore, the model we devise later in the text should rather be viewed as motivated by the GHM framework rather than built on it. Our theoretical results do not depend on any specific mechanism behind possible improved performance of firms within oligarchic groups. Although we cannot separate empirically alternative theories of why oligarchs may be good owners, we argue that reintegration of production chains in the midst of the

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<sup>2</sup> Hart (1995), however, emphasizes that integration is likely to involve some costs as well. In particular, integration involves alienating residual control rights over productive assets from some of the firms and transferring them to a single owner.

<sup>3</sup> This appears to be the case for the vast majority of firms in transition economies including Ukraine. Documented liquidity constraints (e.g., Pissarides, Singer and Svejnar 2003), explosion of barter transactions and all sorts of arrears (e.g., Marin and Schnitzer 2002, 2005) indicate that firms face significant constraints to finance any form of integration.

<sup>4</sup> Mass privatization and lax legislation created favorable conditions for concentration of ownership in a few hands. Explaining the origins of oligarchs is beyond the scope of this paper. We refer the reader to Pappe (2000), Freeland (2000) and Hoffman (2003) who describe the emergence of oligarchs in Russia. Emergence of Ukrainian oligarchs is discussed in Investgazeta (2003), Bondarenko (2000, 2003) and Orlov (2002).

disorganization chaos in transition economies could have played an important role in explaining superior productivity of firms under oligarchic control and could have contributed to economic recovery of the transition economies.

This logic suggests that oligarchs, however demonized they are, may be socially beneficial. Olson (2000) gives a famous example of stationary bandits in medieval China. Indeed, those bandits were unpleasant governors but as long as they had shares in profits from economic activity, they enforced contracts, protected trade, and facilitated production. Thus, encompassing incentives can transform robber barons into benevolent rulers. We formalize these ideas in the following section.

### **Model**

Firm ownership gives control over key decisions: how to price goods, allocate profits, choose customers and suppliers, etc. Often, there is nothing criminal in transferring resources from one firm to another and fair and unfair practices are competing ways to run a business (Johnson et al 2000). For example, transfer pricing can be a legal form of shifting resources from firm A to firm B, though perhaps at the expense of firm A's shareholders, workers and local government. Anecdotal evidence from Ukrainian and Russian firms owned by oligarchs suggests that transfer pricing in various guises (e.g., overstated costs and understated sales) is a good description of how resources are tunneled away from firms. Hoffman describes one such scheme:

A common technique was called “transfer pricing”. An extraction company sold oil to another company at an artificially low price, say, \$2 per barrel. The second company then sold it for export abroad at a much higher price, say \$18 per barrel. The result was that the extraction company, with all the drills, wells, fields, and workers, lost money, while the second company made a handsome profit. The wealth was transferred from one company to another, often in secret using shell companies and off-shore havens. (Hoffman 2003, p. 301)

Klebnikov (2000), Freeland (2000) and others present many similar examples. Hence, we focus on this form of looting. Of course, fully legal activity is rare in transition economies and looting could be a matter of scale rather than its existence. However, we use the stylized dichotomy of looting owner versus transparent owner to contrast the behavior of oligarchs with that of other owners.

Apart from looting, other key stylized facts observed in our data and commonly reported in the business press can be summarized as follows:

1. Oligarchs tend to choose large, not necessarily productive firms. In other words, initially oligarchs seek out large cash generating vehicles, without regard for enterprise efficiency and profitability. Indeed, Berezovsky, a notorious Russian oligarch, said that “... the first thing he wanted to take in a company was its cash flow, and only later he would be interested in owning it” (Hoffman 2003, p. 285). Another rationale for aiming at “big names” is the political influence that can be purchased along with the shares.
2. Oligarchs tend to create vertically integrated production chains (Guriev and Rachinsky, 2005). Visual inspection of corporate structure (see, for example, Investgazeta 2003, 2004) reveals that in the main the groups comprise mostly enterprises that are suppliers or consumers to each other.
3. Oligarchs can own “relatively” unprofitable firms. Here we mean accounting profits rather than true economic value added generated by the firm. For instance, Ukrainian power distribution companies controlled by oligarchs (see Bondarenko 2003 and Investgazeta 2003, 2004) consistently reported losses in 1999–2003.
4. Oligarchs often invest in improving the productivity of the firms they own. This observation is, probably, the most controversial. Yet studies such as Perotti and Gelfer (2001) and Shleifer and Treisman (2005) as well as our casual observations suggest that oligarchs make significant investments in the firms they own.
5. In the early stages of transition, firm looting appears to be particularly severe. Hoffman (2003, p. 500) observes, “... as the oligarchs gained more and more control over their companies, they became better stewards out of sheer self-interest. In the 1990s they fought bitter fights to gain majority ownership; now that it was all theirs, they were more inclined to treat the company nicely.”
6. Oligarchs almost invariably own foreign, typically off-shore companies. This conclusion clearly follows from inspection of the corporate structure of oligarchs’ groups (see Investgazeta 2003, 2004 and Bondarenko 2003). Hoffman (2003, pp. 446-447) notes, “Khodorkovsky [one of the Russian oligarchs] built an off-shore financial network.

Menatep [the core of Khodorkovsky's group] branched out to off-shore havens in Switzerland, Gibraltar, the Caribbean, and other secretive locations where hundreds of millions of dollars could be easily hidden... Khodorkovsky's far-reaching off-shore network was typical for Russian big business. All other oligarchs did the same thing.”

We will present more evidence to support these facts below; now we develop a model that rationalizes these facts. To fix these ideas, suppose that the oligarch has the following benefit function:

$$B_i = \delta S_i + (1 - \tau)((1 - \delta)S_i - C_i) - f(\delta - a_i/(1 + a_i)) - 1_{\delta > 0} \phi, \quad (1)$$

where  $i$  indexes firms,  $S_i$  is the volume of sales,  $C_i$  is the cost of produced output,  $\tau$  is the profit tax rate,  $\delta$  is the degree of looting (or transfer pricing), the function  $f(\cdot)$  measures the penalty for looting firms,  $a_i$  is the markup (equivalently, productive efficiency or profit margin) parameter,  $\phi$  is the fixed fee of being engaged in looting and  $1_{\delta > 0}$  is the indicator function equal to one if  $\delta > 0$  and zero otherwise. To simplify the argument, we assume that the parameters  $S_i$ ,  $C_i$  and  $a_i$  are exogenously given to firm  $i$  and  $(1 + a_i)C_i = S_i$ . Finally, we assume that the penalty function  $f$  is convex and strictly increasing in the looting parameter  $\delta$ . In addition, the penalty is zero at  $\delta = 0$  and infinity at  $\delta = a_i/(1 + a_i)$ .<sup>5</sup> Formally,  $f \geq 0, f(-a_i/(1 + a_i)) = 0, f' > 0, f'' > 0$  and

$\lim_{\delta \rightarrow a_i/(1 + a_i)} f(\delta - a_i/(1 + a_i)) = +\infty$ . Under these assumptions,  $B_i$  is strictly concave in  $\delta$ .

Let us analyze and interpret the benefit function in (1). If the oligarch is transparent, i.e.,  $\delta = 0$ , his benefit of owning firm  $i$  collapses to after-tax profit:  $B_i = (1 - \tau)a_i C_i$ . Alternatively, the oligarch can transfer resources from firm  $i$  by decreasing the value but not the physical volume of sales. Put differently, the books of firm  $i$  record only  $(1 - \delta)S_i$  sales and the first term,  $\delta S_i$ , in (1) is the revenue of the oligarch's firm in a tax haven, which we assume to have a zero tax rate on profit.<sup>6</sup>

<sup>5</sup> Clearly, in the long-run the oligarch cannot loot more from the firm than the cumulative stream of its profits, otherwise the firm goes bankrupt which may induce the government to severely punish the oligarch.

<sup>6</sup> Tax havens can be domestic: charities, free economic zones, etc. For instance, the oligarchic group “Dynamo” has used football club “Dynamo-Kyiv” as its tax shelter. See *The Loophole Economy* chapter in Freeland (2000) for eloquent examples from Russia.

Accordingly, the book before-tax profit of firm  $i$  decreases from  $a_i C_i$  to  $((1-\delta)(1+a_i)-1)C_i$ .<sup>7</sup> This transfer of resources is costly as the looting oligarch incurs a flow cost  $f(\delta - a_i/(1+a_i))$  (e.g., a bribe to officials) and a quasi-fixed fee  $\phi$  (e.g., flow cost of running an unproductive off-shore company to conceal profits). Optimal looting behavior  $\delta_i^*$  maximizes  $B_i$  and satisfies the following first order condition:

$$\delta_i^* = \frac{a_i}{1+a_i} + f'^{-1}(\tau(1+a_i)C_i) = \frac{a_i}{1+a_i} + f'^{-1}(\tau S_i) > 0, \quad (2)$$

and the benefit from the optimal looting is

$$\begin{aligned} B_i^{*O} &= (1-\tau)a_i C_i + \delta^* S_i \tau - f(\delta^* - a_i/(1+a_i)) - \phi = \\ &= (1-\tau)\frac{a_i}{1+a_i} S_i + \delta^* S_i \tau - f(\delta^* - a_i/(1+a_i)) - \phi, \end{aligned} \quad (3)$$

This outcome is compared to the fully legal (no looting,  $\delta = 0$ ) activity

$$B_i^{*L} = (1-\tau)a_i C_i = (1-\tau)\frac{a_i}{1+a_i} S_i.$$

The optimizing oligarch then chooses  $\delta^* > 0$  if

$$\Delta_i \equiv B_i^{*O} - B_i^{*L} = \tau S_i \delta^* - f(\delta^* - a_i/(1+a_i)) - \phi > 0. \quad (4)$$

Note that the oligarch's decision to run an off-shore company is a rational endogenous response to tax differentials across countries. Therefore, the model can explain stylized fact #6.

Given these definitions and assumptions, we can prove the following proposition.

**Proposition 1:**

*Optimal looting has the following properties:*

1.  $\delta_i^* \in [0, a_i/(1+a_i))$ ,
2.  $\partial \delta_i^* / \partial a_i > 0$ ,
3.  $\partial \delta_i^* / \partial S_i > 0$ ,
4. The probability of looting is decreasing in the fixed penalty  $\phi$  and flow penalty  $f(\cdot)$ ,
5. Looting is increasing in the profit tax rate  $\tau$ , i.e.  $\partial \delta_i^* / \partial \tau > 0$ .

Proof: see appendix.

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<sup>7</sup> In the model presented above we assume that looting goes through understating sales. It is an easy exercise to show that the same conclusions emerge if looting is going through overstating costs.

Intuitively, the first three results state that 1) optimal looting is bounded by the firm's profit margin  $a_i$ , 2) the larger the profit margin  $a_i$ , the less noticeable is the transfer of resources and 3) the larger the firm, the larger is the gain from transferring a fixed percent of sales. These results are important in determining which firms are owned by oligarchs.

The last two results of the proposition suggest that in countries with a high penalty for looting we should observe few looting oligarchs. Likewise, transparent behavior is stimulated by low taxes. This appears to be consistent with the experience of transition countries like Estonia and Lithuania, where taxes are low and looting is highly penalized.

The last result has another important implication. Suppose that the oligarch does not have a 100% ownership in firm  $i$  and his share in the equity is  $\eta$ . Then after paying taxes and dividends to other shareholders, his profit is  $B_i = (1 - \tau)\eta a_i C_i$ . Define effective tax rate as  $\tilde{\tau} = 1 - (1 - \tau)\eta$  so that  $B_i = (1 - \tau)\eta a_i C_i = (1 - \tilde{\tau})a_i C_i$  and apply the last result of the proposition. Then the larger the oligarch's share  $\eta$  in the equity, the smaller is the effective tax rate and the weaker the incentive he has to loot the firm. In the beginning of the transition, would-be oligarchs very rarely owned significant shares in firms and, consequently, looting was particularly acute in that period. As they accumulated wealth and shareholdings, they appeared to become less aggressive. This matches stylized fact #5.<sup>8</sup>

Next we turn to the oligarch's choice of which firms to own.

**Proposition 2:**

1. *Suppose that the sales of firm  $i$  are proportional to  $K_i$ , the equity capital of firm  $i$ , i.e.,  $S_i = \kappa K_i$ . Then the oligarch's return on capital is weakly increasing in the firm size measured by sales. The transparent owner's return on capital is independent of firm size.*
2. *The oligarch has a weakly higher return on capital in productive firms than the transparent owner.*

Proof: see appendix.

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<sup>8</sup> The model can be easily extended to analyze protection of minority shareholders. For example, a large  $\phi$  and steep  $f$  can be interpreted as good protection of minority shareholders. Poor protection of minority shareholders is not confined to transition economies. See Johnson et al (2000) for examples from developed economies. The model also sheds new light on transfer pricing used by multinational companies.

Intuitively, the firm size matters for oligarchs because the fixed fee and flow penalty for looting per sales is decreasing in sales. Since oligarchs have a higher return on capital (ROC) in large firms, they are willing to pay a higher price for these firms. In contrast, transparent owners are indifferent between large and small firms as long as they have the same productivity. Hence, it should be the case that oligarchs tend to own large firms. This is in agreement with stylized facts #1 and #3. Indeed, power distributing companies, which are often owned by oligarchs in Ukraine and Russia, are heavily regulated and their reported profits tend to be small. However, their volume of sales is immense thus giving oligarchs the incentives to acquire a stake and control these firms (recall Berezovsky's thirst for large cash flows, which are not directly related to productivity). This result is important for our empirical work when we develop a selection equation to model endogeneity of firm ownership.

To understand the second part of the proposition, note from (3) and (4) that for any increase in productivity  $a_i$  and for any given looting parameter  $\delta$ , the oligarch captures a direct gain in after-tax profits, receives a larger transfer to his off-shore company (because he transfers a fixed percent of sales to his off-shore company) and pays a smaller penalty for looting  $f(\delta - a_i / (1 + a_i))$  as the profit leakage becomes less noticeable.

We now generalize the model and allow firms to invest in productivity-enhancing projects. We assume that each firm can undertake a revenue-enhancing investment which leaves the cost of input  $C_i$  unaltered and boosts its productivity from  $a_{1i}$  to  $a_{2i}$  with  $a_{2i} > a_{1i}$ . The flow cost of the project is  $\chi C_i$ . Any rational owner should make the investment if it increases profits. As the following proposition shows, oligarchs are more likely to make such an investment.

**Proposition 3:**

*The oligarch makes (weakly) larger investments than the transparent owner.*

Proof: see appendix.

The reason why oligarchs are more willing to invest is that they have a higher return on firm size and productivity than transparent owners. Specifically, with higher productivity, oligarchs can hide tunneling more easily. Since they transfer a fixed percent of sales to off-shore companies and

looting is increasing in productivity, for every increase in productivity they make a larger transfer of firm resources to tax havens, thus avoiding high taxes at home and receiving a higher return on investment. In contrast, transparent owners have to share the gains from increased productivity with the government and thus have weaker incentives to invest. This explains stylized fact #4.

This proposition shows that oligarchs have stronger stimuli to improve firm productivity. However, understated sales and likewise overstated costs can translate into a low measured productivity. Formally, let us denote recorded sales with  $\tilde{S}_i$  and measured productivity with  $\tilde{a}_i$ . Then the measured productivity is

$$\tilde{a}_i = \frac{\tilde{S}_i - C_i}{C_i} = \frac{(1 - \delta_i^*)(1 + a_i)C_i - C_i}{C_i} = (1 - \delta_i^*)(1 + a_i) - 1. \quad (5)$$

It follows that as long as  $\delta_i^* > 0$  we should observe  $0 < \tilde{a}_i < a_i$ . Because optimal looting  $\delta_i^*$  is increasing in productivity, a genuinely productive firm owned by an oligarch may look unproductive even after a productivity enhancing investment.

In theory, the investing oligarch may be so productive that he pays more in taxes than the transparent owner who does not invest. Observe that for a fixed  $\delta$ , the investing oligarch generates higher profit and thus pays higher taxes. On the other hand, higher productivity leads to larger looting  $\delta$ , thereby decreasing the tax base. If the gain in productivity is sufficiently large and looting is relatively small, the oligarch undertaking the investment would generate more tax revenues than the transparent non-investing owner. The following proposition provides conditions for when this can happen.

**Proposition 4:**

*For a sufficiently large increase in productivity, the investing oligarch pays more in taxes than the non-investing transparent owner if and only if the marginal flow penalty  $f'$  is elastic.*

Proof: see appendix.

We now turn to the oligarch's inclination to vertically integrate firms. There are two firms: upstream (U) and downstream (D) with productivity parameters  $a_U$  and  $a_D$ , respectively. The upstream firm sells its output to the downstream firm so that the sales of the upstream firms are equal

to the costs of the downstream firm. To capture the complementarity of assets, relation-specific investments and other forms of synergy, we assume that in the case of integration (I) productivity is higher than in the no-integration case, that is,  $a_I > a_U + a_D + a_U a_D$ . Consistent with focusing on the revenue side, we assume that integration does not affect the cost of the upstream firm. Integration of firms is costly because of regulation obstacles, reorganization disruptions, etc. Hence, we assume that the flow cost of integration is  $\chi C_U$ . This setup brings us directly to the GMH argument where the costs and benefits of integration are analyzed.

The no-looting after-tax profits are

$$U: \pi_U = (1 - \tau)(S_U - C_U) = (1 - \tau)a_U C_U,$$

$$D: \pi_D = (1 - \tau)(S_D - C_D) = (1 - \tau)(S_D - S_U) = (1 - \tau)a_D(1 + a_U)C_U,$$

$$I: \pi_I = (1 - \tau)(S_D - C_U) = (1 - \tau)a_I C_U.$$

An owner will choose to keep firms separate or integrate them into a conglomerate depending on which scenario yields a larger profit. The relevant comparison is again the looting oligarch versus the transparent owner. The change in the after-tax profit of the transparent owner who integrates firms is  $\Delta^L = \pi_I - \pi_D - \pi_U - \chi C_U$ .<sup>9</sup> If  $\Delta^L > 0$ , the transparent owner integrates firms, captures the gains in productivity and generates higher tax revenues.

For the oligarch, the change in benefit is

$$\Delta^O = B_I - B_D - B_U - \chi C_U \tag{6}$$

where  $B_I$ ,  $B_D$ , and  $B_U$  are the oligarch's benefits from running integrated, downstream and upstream firms, respectively. Using Propositions 3 and 4, we prove the following result.

**Proposition 5:**

1. *The oligarch has greater incentives to integrate firms vertically if assets are complementary, investments are relation specific or there are other synergies from the merger. Specifically it always holds that  $\Delta^O \geq \Delta^L$*
2. *For a sufficiently large increase in productivity, the integrating oligarch generates higher tax revenues than the transparent owner who does not merge firms if the marginal penalty for looting  $f'$  is elastic.*

Proof: see appendix.

There are several reasons why the oligarch wants to integrate firms. First, he economizes on the fixed cost of running an off-shore company. Second, by raising productivity from  $a_D$  and  $a_U$  to  $a_I$  the oligarch can more easily tunnel a fixed percentage of sales and transfer it to his off-shore company.<sup>10</sup> Recall that the oligarch's ROC is increasing in the firm size and productivity. Because synergies from the merger raise the overall productivity of the formed conglomerate, the oligarch's benefit increases more than that of the transparent owner and, therefore, under certain constellations of productivity parameters and costs of merger, the oligarch rationally chooses to invest when the transparent owner does not. Given the fact that the oligarchs are likely to face smaller integration costs because of their political connections, they effectively have even greater incentives to integrate firms. Proposition 4 rationalizes stylized fact #2.

The second part of the proposition addresses the question of whether the government should stimulate integration. The answer is clearly “yes” if the owners are transparent because mergers increase the tax base. What about the oligarchs? The answer depends on the relative strength of the productivity gains and looting motives. Like in our analysis of investment, elastic marginal penalty for looting is the necessary condition for tax revenues to increase when the firms are integrated.

Propositions 3 and 5 combined suggest that oligarchs, *ceteris paribus*, will tend to generate surplus, which would otherwise go unnoticed, by integrating vertical production chains and investing into profitable projects. As long as the amount looted by the oligarchs is less than the incremental surplus for the economy, these activities are socially beneficial (Propositions 4 and 5). The incentive for oligarchs to engage in such ventures is rooted in the existence of some “tax-free” extra profit which is looted off-shore. The relative efficiency of oligarchs compared to transparent owners is thus directly dependent on the level of  $\delta^*$ , among other things. We can label this type of efficiency as the **“first-order” efficiency**.

Hart (1995), however, argues that although some basic forms of property rights arrangements can yield better results than others, none is able to produce the first-best levels of

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<sup>9</sup> We assume that the cost of investment is not tax deductible.

<sup>10</sup> Thus, the oligarch has incentives to integrate firms even in the absence of synergies.

investment and maximize trade surplus in absolute terms. We now move on to show that under certain circumstances oligarchs are not only able to be relatively more efficient, but may also demonstrate absolute efficiency in choosing investment levels and maximizing production surplus.

**Proposition 6:**

*Under certain circumstances oligarchs can achieve maximum socially desirable levels of investment, unattainable by other ownership arrangements.*

Proof: see appendix.

Proposition 6 contains an even stronger result than Propositions 3 to 5 combined — it suggests that in some cases the oligarch's ownership can be superior to upstream-, downstream- and no-integration arrangements of property rights. The efficiency described in Proposition 6 has a different nature from that mentioned earlier, since it derives not from the level of  $\delta^*$ , but from the ability of the oligarch to vary  $\delta^*$  with the level of investment and sales (the “**second-order efficiency**”). Hence, Proposition 6 suggests that business conglomerates controlled by oligarchs can be competitive in the long run as they can reach the first-best levels of relation-specific investments.

The predictions of the model are consistent with reality. Oligarchs indeed tend to own larger firms. Although in practice oligarchs tend to own profitable firms, they do own unprofitable firms as well. If the firm has high productivity (or markup), it is easier to hide a transfer of resources and report “standard” profits. In economies with low taxes and a high penalty for looting, oligarchs rationally choose to stay within legal limits. Oligarchs tend to loot aggressively firms in which they have a small stake. The model also explains why profits of a single firm owned by an oligarch can fail to reveal information about productivity of the oligarch's chain of firms as a whole and measured productivity can be low. Our model accounts for all stylized facts we have listed above.

The model shows that oligarchs can be parasites in the sense that they do not generate additional surplus and simply redistribute profits. Yet, the model also demonstrates that if there are synergies from integrating production chains or productivity enhancing investments, oligarchs are likely to generate surplus and benefit the society. As we argue below, oligarchs could have played an important role in reintegration of production chains and, thus, could have significantly contributed to the economic recovery of transition economies. Finally, the model can explain why conglomerates led

by oligarchs may be a viable form of organization even as the economy develops and more progressive institutions enter the scene.

### **Discussion and Context**

Using our framework, we can construct a consistent story of the development of industries in the former Soviet Union (FSU) in the 1990s. In the Soviet era, the state was the sole owner of residual control rights in all medium and large-sized enterprises. The system was designed to fulfill the plan and maximize output of certain top-priority goods and services (in order of importance – military sector products, industrial construction, basic necessities). The degree of vertical integration was close to its technological maximum and the whole system was driven by a state plan. Although the plan was supposed to be a product of objective budgeting, upstream firms, which produced products from a top-priority list, and their immediate contractors had significant bargaining power over the downstream firms. This resulted in considerable overinvestment in physical capital in heavy industries and underinvestment in most consumer-oriented industries.<sup>11</sup>

Upon the break-up of the USSR, the state lost much of its power and *de facto* residual rights of control were appropriated by the management of respective firms. This corresponds to the non-integration ownership structure discussed in the previous section. Underinvestment did indeed occur and the total value of specific relationships within the economy, as well as its output, declined dramatically (see Figure 1). It is worth emphasizing that underinvestment was equally acute for heavy industries, as well as for the light industries—in the case of the latter it was associated with more explicit underinvestment in new technology and new capacities, in the case of the former it took the form of insufficient investment into the restructuring of installed capacities and refurbishing the technological process.

Disorganization of production is the leading explanation of the output's U-shaped dynamics in transition countries. Blanchard and Kremer (1997) suggest that private potential uses of resources outweigh conventional state uses and divert inputs from the public sector of the economy. Given

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<sup>11</sup> The analysis of inefficiencies and anomalies pertaining to planned economies may be found in Kornai (1992) or in more recent work by Gaidar (1997).

specificity of inputs, this generates a downturn in output. In the course of time, private uses improve and total output rises.<sup>12</sup> Roland and Verdier (1999) develop a search model where firms of two types, “low productivity” and “high productivity”, engage in vertical productive relationships. The fall in output is explained as a diversion of resources from production to search for better production matches. Like the Blanchard-Kremer model, this model also predicts the U-shape trajectory in output. Although both models are built on solid micro-foundations, neither can explain who restores production chains, why it takes more time to recover for some countries than others, and why firms did not reintegrate quickly after liberalization.<sup>13</sup> One of the contributions of this paper is providing an account of who improves private uses and who makes efficient matches of firms. We argue that oligarchs in Ukraine and other FSU countries could have been the anonymous revitalizing force in disorganization models and, thus, oligarchs could have contributed to economic recovery in the FSU countries by reintegrating production chains to levels efficient in the market economy.

In order to make predictions of our model testable, we need to specify who the oligarchs are and how these oligarchs improve performance. We first define who can be labeled an “oligarch” in the context of the Ukrainian economy. Clearly, it should be someone who 1) employs enough financial resources to appropriate controlling stakes and control the management in a number of large vertically related enterprises, 2) has enough political weight and lobbying ability to secure attained residual control rights, and 3) possesses enough bargaining power to implement redistribution of cash flows within the group and enforce internal and external contracts. Specifically, an entity is called an “oligarch” if it meets the following criteria (similar to those in Pappé 2000): 1) the entity controls at least three enterprises, 2) the entity has at least one for-profit enterprise, 3) enterprises controlled by the entity regularly interact and coordinate their businesses (technology, marketing, etc.) and the entity controls decision-making in these enterprises, and 4) the entity has at least one representative in

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<sup>12</sup> Marin and Schnitzer (2005) argue that the burst of barter in transition economies was a response to hold-up problems induced by the disorganization.

<sup>13</sup> Empirical analysis of disorganization theories (e.g., Konings and Walsh 1999, Recanatini and Ryterman 2000, Johnson, McMillan, and Woodruff 2002, Marin and Schnitzer 2002, 2005) focused on security of property rights while we focus on the effects of their arrangements.

the parliament or government that is legally or publicly associated with this entity or the group controlled by it.<sup>14</sup>

The next step is to analyze particular mechanisms by which an “oligarch” can improve enterprise performance and induce larger investment. We have uncovered four such plausible basic mechanisms: 1) *pure coordination* — improved group-level planning and management efficiency, related to observability and verifiability of investments; 2) *contract enforcement* — imposition of a binding discipline on group enterprises and effective enforcement of delivery by outside contractors, which ensures more certainty in the trade relationship and makes outside options less binding; 3) *internal capital markets* — markets established within a group to ensure that marginal productivity of investments is equalized throughout the group and first-best levels of investment are attained; and 4) *access to external finance* — the ability of an “oligarch” to provide cheaper and better access to external lending sources for all members of the group.

Our approach is explicitly concentrated on the first two mechanisms but it nests all four. Indeed, the organization of an internal capital market is a prerequisite for a successful “oligarch” integration (recall that the oligarch must be able to move resources within the group to maximize total surplus). Improved access to external finance is largely a result of enhanced financial management, removal of severe information asymmetries, and increased security of property rights — in a typical business group all these developments can be reasonably attributed to improved coordination and contract enforcement.<sup>15</sup> Since all four channels are highly interconnected, we do not separate them and instead focus on the aggregate effect.

In brief, our model predicts that some owners promote efficiency in investment and production more than other owners. In particular, our propositions suggest that oligarchs creating closed groups of vertically integrated enterprises can be associated with increased volumes of investment and improved enterprise performance.

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<sup>14</sup> This criterion is supposed to filter those groups that have no sufficient political power and thus are extremely susceptible to political or legal action by competitors, which would endanger contract enforcement or even ownership claims.

<sup>15</sup> There is a large literature studying the internal markets for members of business groups, e.g., Samphantharak (2003) and the literature cited therein. The relevance of liquidity constraints in the context of transition economies has been extensively studied, e.g., Marin and Schnitzer (2002, 2005).

### III. AN EMPIRICAL TEST OF THE PRODUCTIVE OLIGARCH THEORY

While our model yields a number of potentially falsifiable predictions, we are unfortunately not able to test many of them because of the enormous size of the industrial groups (up to 800 legal entities), unobservable nature of looting, lack of consolidated reporting, and presence of numerous trade houses and off-shore vehicles within the conglomerates. As a result, we focus on the following testable prediction: the presence of an oligarch improves the performance (productivity) of *each* enterprise entering the group. To test this hypothesis, we estimate a production function and, controlling for selection, examine whether the productivity of firms owned by oligarchs is, *ceteris paribus*, higher than that of firms not owned by oligarchs.

#### Data

We rely on two original sources of information: the State Stock Market and Securities Commission (SSMSC) and the State Statistics Committee (SSC). Both agencies collect firm-level financial, ownership and operating data on an annual basis and maintain comprehensive databases: the former carries out this function for all entities that are either incorporated as open joint stock companies (OJSCs), or issue publicly traded securities; the latter collects data for all legally registered businesses in Ukraine. The two datasets are merged by unique firm identification codes.

The SSC collects a relatively small set of economic indicators such as the number of employees, sales, value added, and capital assets. The key feature of this data set is that it starts in 1993 (after liberalization and just before privatization) with a reasonably large cross section of firms. The data collected by the SSMSC are, by far, more informative, but complete cross-sections of OJSCs are available only for recent years. SSMSC requires firms to disclose externally audited balance sheets and income statements, the main business competitors and partners, management board composition and other characteristics of the firm. The key variable from this data set is ownership structure: shares and owners are identified (name, firm identification code, country of origin, share). We complement this information with detailed ownership records for 2002 in the database maintained

by the Association of Registrars of Ukraine (ARU) and the State Tax Administration of Ukraine (STAU). We utilize these data sets to track ownership relationships between enterprises and business groups, i.e., we separate entities controlled by “oligarchs” from common publicly or privately held ventures and state-owned enterprises.

Although *a priori* effects of property rights allocation and security on a firm’s performance and investment pattern are expected to be significant regardless of the firm’s size, we limit the scope of our analysis to fairly large enterprises for several reasons. First, small enterprises are less likely to be involved in business conglomerates, as their expected cash generating ability (which is blatantly related to firm size) is relatively small in comparison to the transaction costs of integration and coordination. Second, small enterprises in Ukraine are subject to far less strict disclosure requirements than their medium and large-size counterparts. Third, reliability of financial information provided by the small companies is presumably much poorer because of less stringent reporting requirements, lax accounting procedures, and much weaker public control. Hence, we consider firms with at least 500,000 UAH (approximately USD 100,000) in assets.<sup>16</sup>

Our working data set consists of firms present in both i) the SSC data base in 1993 and ii) the SSMSC dataset in 2002. The size of this sample is 1,917 firms while the size of the SSC data set in 1993 is approximately 7,000, and the size of the SSMSC data set in 2002 is approximately 8,000 firms. In the course of privatization, large firms were required to be incorporated before they were sold, while relatively small enterprises did not have to be incorporated.<sup>17</sup> Thus, we are more likely to find larger firms in this sample than in the population. Attrition effects are likely to be small in determining the composition of the sample because large firms are very unlikely to go bankrupt in Ukraine predominantly for political reasons and weak bankruptcy laws.<sup>18</sup>

Oligarchs are the key ingredient in our analysis. Our working definition of oligarchs (see previous section) identifies 13 oligarchic groups, with *System Capital Management* led by Rinat

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<sup>16</sup> We omit the criterion for the number of employees, commonly used for such filtering, in order to retain trade and financial intermediaries in the sample.

<sup>17</sup> Even firms 100% owned by the state are incorporated in anticipation of future privatization.

<sup>18</sup> Sample selection is negligible for most specifications we consider as the coefficient on the Mills ratio is not statistically different from zero.

Akhmetov being the largest group in Ukraine (Table 1). In total, they control 276 firms (14% of the sample). We draw on various sources—most importantly the SSMSC/ARU/STAU data and business press<sup>19</sup>—to determine if a given enterprise is owned by an oligarch. This task is particularly challenging since oligarchs very rarely own OJSCs directly, rather they typically own OJSCs through a chain of holdings, intermediate firms, and off-shore companies.<sup>20</sup>

A simplified corporate structure of a typical Ukrainian oligarchic group “Pryvat” is presented in Figure 2.<sup>21</sup> Note the presence of off-shore companies, which is an essential feature of all oligarchs. The “Pryvat” group, like other oligarchic groups, has vertically integrated chains in the production of metals and chemicals. Parallel examples from Russia are Lukoil of Alekperov<sup>22</sup> and Yukos of Khodorkovsky. Note that oligarchs in the post-Soviet countries have much in common with the Korean *chaebol*, Japanese *keiretsu*, or other ‘family’-like business groups across the world (La Porta, Lopez-De-Silanes, and Shleifer 1999).

The main descriptive statistics are reported in Table 2. On average, the firms owned by oligarchs have larger profits than firms in the control group. Yet, the large standard deviation indicates that loss-making firms are not uncommon in oligarchic groups.

Oligarchs tend to have stakes in larger firms. In our sample an average oligarch-owned firm has triple the amount of total assets on its balance sheet compared to its counterpart from the control group. The ratio for the number of employees is of the same rank: 1520 employees for an average firm belonging to some business conglomerate versus only 514 for a typical enterprise in the control group. In 2002, an average firm in an oligarch group has a far “richer” capital endowment: the net book value of fixed assets is approximately three times larger for such an enterprise than for a typical

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<sup>19</sup> This source is particularly helpful in identifying off-shore companies affiliated with oligarchic groups. A few particularly useful reviews of oligarchic groups were published in *Investgazeta* (2003,2004) and Bondarenko (2003).

<sup>20</sup> With respect to Berezovsky, one of the most prominent Russian oligarchs, Hoffman (2003, p. 401) observes, “... his [Berezovsky’s] holdings were a mysterious empire shielded by layers of shell companies and off-shore havens.”

<sup>21</sup> More complete structures for this and other groups can be found in *Investgazeta* (2003, 2004) and Bondarenko (2003). Analogous structures for Russian oligarchs can be found in Pappe (2000).

<sup>22</sup> See, for example, Hoffman (2003) and “In the land of Oligarchs” by Peter Maass in *New York Times Magazine* (Aug 1, 2004).

control group representative.<sup>23</sup> The gap does not seem so large when put into per employee terms: the amount of capital per employee is only 9.4% larger for an oligarch-owned firm than for non-oligarch-owned firms. This difference does not seem large enough to explain fully the 23% difference in value added per employee between these two groups of firms.

In terms of industry concentrations, oligarchs have the largest representations in the metal and chemical industry. This is also hardly surprising because these industries are export oriented and, as such, are the most secure source of hard currency cash flows. Since most enterprises in these industries are in the Eastern Ukraine, oligarchs have the largest share of firms owned in the Eastern Ukraine.<sup>24</sup>

We believe that all of these basic observations can be plausibly applied to the Ukrainian economy at large without a loss of significance (at least to the manufacturing sector). Although the constructed sample contains only open joint stock companies, it captures most of the national ‘blue chips’. The sampled firms account for approximately 12.5% of the Ukrainian GDP in 2002 and for about 18.9% of the value added in the industry and services.<sup>25</sup> This is a large share indeed, though not unexpected as open public companies produce slightly more than 30% of the Ukrainian GDP and our sample comprises the largest quarter of them. Therefore, the sample is interesting from both academic and policy standpoints.

## **Econometric Methods and Specification**

If ownership were assigned at random, difference in sample means of treatment (owned by oligarchs) and control (not owned by oligarchs) groups would be a consistent estimate of the average treatment effect of being owned by an oligarch. Unfortunately, Table 2 clearly reveals that the

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<sup>23</sup> Of course, one should take these estimates of capital stock quite cautiously. Yet, given no material differences in accounting practices of oligarchs and the control group, the number indicated above should give a meaningful estimate of the gap between the firms in each group.

<sup>24</sup> Note that other industries and sectors such as transport and agro-business are not in our sample. We have to drop observations in these sectors because we did not have data for these firms in 1993. However, oligarchs do own firms in these sectors. See Figure 2 for an example.

<sup>25</sup> Total value added for the sample amounted to 28.3 bln UAH in 2002, GDP was 226 bln UAH in the same year, value added in industry and services was 149 bln UAH (source: State Statistics Committee of Ukraine).

assignment is not random and more sophisticated methods should be used to estimate the treatment effect.

We employ two estimators to consistently estimate the average treatment effect (ATE) of oligarchs on firm performance: instrumental variables (IV) and Maddala's (1983) treatment effects (TE) model. Although IV and TE are built on different assumptions, in practice they often give similar answers (Vella and Verbeek 1999). Wooldridge (2002), however, notes that IV is more robust to various misspecifications. Both methods fix an apparent flaw in observational studies: non-random assignment of treatment. These methods, nevertheless, require correctly excluded predetermined variables explaining oligarch's choices; otherwise, one cannot credibly isolate the treatment effect.

Fortunately, we can trace firms from pre-privatization days (i.e., before 1994) to present time. In 1993, essentially all large firms were state owned. Thus, we have some uniformity in the pre-treatment. Importantly, prices were liberalized before 1993 so that firm performance in 1993 was a better indicator of future profitability than performance in earlier periods when prices were largely regulated. Hence firm characteristics in 1993 were important for oligarchs in 1995-1999 when most firms were privatized. By 2002, large firms have been by and large incorporated and thus they show up in our sample.

As for the model governing oligarch's choices, our theoretical results indicate that firm size and productivity are the relevant variables. We measure productivity as the output to capital ratio, which is a proxy for return on capital, and the output to labor ratio, which is a proxy for labor productivity. Firm size measured by sales is particularly important as it differentiates transparent owners from oligarchs. In addition, we include a firm's capital assets to capture the asset stripping motive with larger capital stock being *ceteris paribus* more attractive for oligarchs. Capital assets and employment may also serve as proxies for the firm size. Profitability in 1993 appears to be a poor predictor of a firm's cash generating ability because in 1993 most firms had a heavy burden of social commitments inherited from the Soviet times, e.g., financing kindergartens and hospitals for their employees. As a result, our selection (TE) or first stage (IV) equation is

$$OLIGARCH_i = \Phi\left(\alpha_1 \ln Sales_i^{(93)} + \alpha_2 \ln L_i^{(93)} + \alpha_3 \ln K_i^{(93)} + \mathbf{X}_i^{(93)}\boldsymbol{\gamma} + \varepsilon_i\right) \quad (7)$$

where  $i$  indexes firms,  $OLIGARCH$  is a dummy variable equal to one if the firm is owned by an oligarch and zero otherwise,  $Sales_i^{(93)}$  is sales in 1993,  $L_i^{(93)}$  is the number of employees in 1993,  $K_i^{(93)}$  is the beginning-of-the-year value of capital in 1993,  $\mathbf{X}$  is a set of industry and regional dummies for 1993, and  $\Phi$  is the c.d.f. of the standard normal distribution. Note that because we use variables in logs, specification (7) is the reduced form of a specification that, in addition to the level of the variables, includes logs of the output/capital, output/labor, and capital/labor ratios.

To measure the effect of the oligarch on firm productivity, we estimate the Cobb-Douglas production function in growth rates of the respective variables between 1993 and 2002. The precise specification is as follows:

$$\log\left[VA_i^{(02)}/VA_i^{(93)}\right] = \alpha_K \log\left[K_i^{(02)}/K_i^{(93)}\right] + \alpha_L \log\left[L_i^{(02)}/L_i^{(93)}\right] + \beta \cdot OLIGARCH_i + \mathbf{X}_i\gamma + u_i \quad (8)$$

where  $VA_i$  is the value added,  $K_i$  is the capital (fixed assets beginning of the period),  $L_i$  is the average number of employees,  $\mathbf{X}_i$  is the set of regional and industry dummies. Importantly, because we estimate the production function in log differences, we eliminate firm specific productivity and therefore avoid endogeneity of inputs arising from the transmission bias identified by Marschak and Andrews (1944). Furthermore, note that using growth rates over long horizons attenuates the possible adverse effects of measurement errors in the right hand side variables, especially capital (see Griliches and Hausman 1986). The estimate of  $\beta$  measures the effect of the oligarch's ownership on the firm's productivity. This specification is similar to the one used by Guriev and Rachinsky (2005).

The treatment effects model estimates (7) and (8) simultaneously. A useful byproduct of estimating the TE model is the correlation coefficient for  $u_i$  and  $\varepsilon_i$ , the sign of which can inform us about direction of bias in the OLS estimates. In contrast, IV uses estimated probability from (7) to instrument  $OLIGARCH$  in (8).<sup>26</sup>

## Results

The estimates of the first stage regression (7) are presented in Table 3. Consistent with our theoretical model, the volume of sales and capital stock are important determinants of the oligarch's

ownership. Interestingly, employment is irrelevant provided capital and sales are included. This suggests that labor productivity, which in contrast to sales is not directly observable, was not of particular importance in the oligarch's decision to own a firm. This appears to be consistent with anecdotal evidence. We also do not find any specific regional preference in oligarchs' choices. However, owning firms in the metals industry appears to be an oligarch's desideratum. Machine building, light/food and chemical industries are also relatively more attractive to oligarchs than firms in the energy and services sectors. Overall, the model is statistically significant at all conventional significance levels and it has a reasonable fit.

Table 4 presents the estimates for the production function given by equation (8). We include only one regional dummy *Kyiv* because other regional dummies have economically small and statistically insignificant coefficients. When the model is estimated by OLS (column 2), the coefficient on *OLIGARCH* is positive but not statistically significant. The coefficients on labor and capital are statistically significant with sizes typically found for production functions estimated on long differences of output and inputs (e.g., Griliches and Hausman 1986 and Tybout and Westbrook 1996). The magnitude of the coefficient on the labor growth rate reflects the fact that labor proxies for all variable inputs and unobserved effort and utilization rates.

OLS does not correct for the endogeneity of *OLIGARCH*; thus, finding a weak difference in productivity does not refute our argument. Once endogeneity is taken into account, oligarchs do appear to have a higher productivity than other owners. Specifically, IV and TE estimates indicate that, *ceteris paribus*, oligarchs have a 50%-70% higher value added growth rate than non-oligarchs over 1993-2002.<sup>27</sup> Although the size of the coefficient may appear to be somewhat large, it is plausible in the Ukrainian context. Recall that the economic collapse in the early 1990s (GDP had fallen 60% by 1997) led to very low capacity utilization rates. There is extensive anecdotal evidence

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<sup>26</sup> Details on the procedure can be found in Wooldridge (2002, Chapter 18). Importantly, the first stage may be misspecified and one does not have to correct standard errors in (8) for using an estimated probability as an instrument.

<sup>27</sup> Oligarchs are likely to overstate costs and understate sales thus reducing measured productivity (see theoretical section). Hence, this estimate is likely to be a lower bound.

that inactive and largely idle plants were turned into three-shift plants with the change of owners.<sup>28</sup> Hence, a 50% expansion of output is more than likely. Also, our finding is consistent with Guriev and Rachinsky (2005) reporting that in 2001/2002 sales grew 10% faster in firms owned by Russian oligarchs than in other domestically owned firms.

Note that the correlation  $\rho(u_i, \varepsilon_i)$  is statistically significantly different from zero (column 5). Likewise, the Hausman test (column 3) rejects the equality of OLS and IV estimates. Thus, estimating (8) by OLS does not yield a consistent estimate of  $\beta$ . Also a negative correlation between  $u_i$  and  $\varepsilon_i$  suggests that oligarchs pick underperforming firms and then improve their productivity. This is generally in agreement with our theoretical model. Note that large firms created in the Soviet time could have been relatively unproductive in the market economy. According to our model, oligarchs should want to have large and not necessarily productive firms. Once they acquire large firms they have the incentive to enhance the productivity of those firms.

Of course, these results depend on whether the probability of being owned by an oligarch is a sufficiently strong instrument for actual ownership by an oligarch. To verify that the instrument is not weak, we consider the following diagnostic statistics. The first stage F-statistic is well above 20, the critical value suggested by Stock, Wright and Yogo (2002, Table 1, p. 522). Hence, it is unlikely that the instrument is weak. Alternatively, one can consider inference methods that are fully robust to weak instruments, e.g., the Anderson-Rubin (AR) statistic. We find that the AR statistic for the null hypothesis  $\beta = 0$  exceeds the 5% critical value computed as in Moreira (2003). Therefore, our conclusions are robust on this front as well.

The results survive in a number of robustness checks. Modifications in specifications and samples lead to qualitatively the same conclusions. Therefore, oligarchs are indeed likely to improve productivity of the firms they own.

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<sup>28</sup> See for example, “Alchevsk Steel Mill: A Year for Five” in *Zerkalo Nedeli* (#42, 1999) and “The Conflict of Special Interest” in *Zerkalo Nedeli* (#39, 2003).

#### IV. CONCLUDING REMARKS

The paper provides a theoretical model and an empirical test of the economic behavior of “oligarchs”, the strong financial and industrial groups observed in many countries in Central and South-East Asia, Latin America, and Central and Eastern Europe.

Our theoretical model explains important stylized facts about the behavior of oligarchs. The model predicts that oligarchs are more likely than other owners to invest in productivity enhancing projects and to vertically integrate firms to capture the gains from possible synergies. Furthermore, oligarchs can be socially beneficial. We argue that the economic recovery in transition countries of the FSU can be linked to the formation of strong business groups restoring and reinvigorating production chains in those countries. In addition to the common sense wisdom of low taxes and high *level* of penalty for looting, the model suggests an important welfare-improving policy recommendation that the marginal penalty for looting should be elastic.

We test the implications of the model using a unique data set constructed from a number of firm-level databases. Importantly, unlike other studies analyzing business groups, our empirical tests control for the endogeneity of firm ownership. Our econometric results suggest that oligarchs are “good” at least in some dimensions. In particular, oligarchs do appear to stimulate productivity, that is, firms owned by oligarchs tend to have higher productivity growth than firms not owned by oligarchs. This result is compatible with Olson's “stationary bandit”, i.e., even robber barons can be socially beneficial.

The policy implications of our results are not straightforward. Oligarchs have consequences other than just promoting productive efficiency. In particular, oligarchs’ activities inevitably lead to a concentration of the industry. For instance, Guriev and Rachinsky (2005) report that oligarchs in Russia have enormous control over the Russian economy. Therefore, oligarchs can exercise their monopolistic power thereby causing losses to the society. Normative issues such as the distribution of surplus should also be considered.

In general, a detailed cost-benefit analysis is required to make a final judgment concerning the desirability of wide scale “oligarch” integration for the whole economy, and this research can

provide a starting point for this analysis. Intuitively, one may expect that costs are likely to outweigh benefits in the long run — given the examples of “oligarch” societies like Indonesia. Indeed, Acemoglu (2003) presents a model where oligarchic societies can dominate democracies in the short run but democracies dominate oligarchies in the long run. Nonetheless, the existence of oligarch/business groups is typical for all developed economies as well as developing and transition countries, and the ultimate utility of oligarch/business groups seems to be a matter of effectiveness of public control and other measures (e.g., openness of the economy) to restrain the power of these groups.

## V. WORKS CITED

- Acemoglu, Daron, "The Form of Property Rights: Oligarchic vs. Democratic Societies," NBER Working Paper # 10037, 2003.
- Black, Bernard S. and Anna S. Tarassova, "Institutional Reform in Transition: A Case Study of Russia," Stanford Law School Working Paper #238, 2002.
- Blanchard, Oliver and Michael Kremer, "Disorganization," *Quarterly Journal of Economics*, CXII (1997), 1091-1126.
- Bondarenko, Kost, "Who Owns What in Ukraine," *Ukrainian Pravda*, 17 July 17 2003, Kiev, Ukraine.
- , *Atlantes and Caryathides under the President's Roof* (Lviv, Ukraine: Kalvaria 2000).
- Coase, Ronald, "The Nature of the Firm," *Economica* IV (1937), 386-405.
- , "The Problem of Social Cost," *Journal of Law and Economics* III (1960), 1-44.
- de Meza, David and Ben Lockwood, "Does Asset Ownership Always Motivate Managers? Outside Options and the Property Rights Theory of the Firm," *Quarterly Journal of Economics* CXIII (1998), 361-86
- Djankov, Simeon and Peter Murrell, "Enterprise Restructuring in Transition: A Quantitative Survey," *Journal of Economic Literature* XL (2002), 739-792.
- Freeland, Chrystia, *Sale of the Century: Russia's Wild Ride from Communism to Capitalism* (New York: NY: Crown Business, 2000).
- Frydman, Roman, Cheryl Gray, Marek Hessel, and Andrzej Rapaczynski, "When Does Privatization Work? The Impact of Private Ownership on Corporate Performance in Transition Economies," *Quarterly Journal of Economics* CXIV (1999), 1153-1191.
- Gaidar, Yegor, *Anomalies of the Socialist Growth* (Moscow, Russia: Eurasia, 1997 [in Russian])
- Griliches, Zvi and Jerry A. Hausman, "Errors in Variables in Panel Data," *Journal of Econometrics* XXX (1986), 93-118.
- Grossman, Sanford G. and Oliver D. Hart, "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy* XCIV (1986), 691-719.
- Guriev, Sergei and Andrei Rachinsky, "The Role of Oligarchs in Russian Capitalism," *Journal of Economic Perspectives*, 2005.
- Hart, Oliver D., *Firms, Contracts, and Financial Structure* (Oxford, United Kingdom: Clarendon Press, 1995).
- Hart, Oliver D., and John Moore, "Property Rights and the Nature of the Firm," *Journal of Political Economy* XCVIII (1990), 1119-1158.
- Hoffman, David E., *The Oligarchs: Wealth and Power in the New Russia* (New York, NY: Public Affairs, 2003).
- Investgazeta, "Top 100," 24 June 2003, Kiev, Ukraine.
- Investgazeta, "Top 100," 26 July 2004, Kiev, Ukraine.
- Johnson, Simon, John McMillan, and Christopher Woodruff, "Property Rights and Finance," *The American Economic Review* XCII (2002), 1335-1356.
- Johnson, Simon, Rafael La Porta, Florencio Lopez-de-Silanes and Andrei Shleifer, "Tunneling," *American Economic Review* XC (2000), 22-27.
- Khanna, Tarun, and Jan W. Rivkin, "Estimating the Performance Effects of Business Groups in Emerging Markets," *Strategic Management Journal* XXII (2001), 45-74.
- Klebnikov, Paul. *Godfather of the Kremlin: Boris Berezovsky and the Looting of Russia* (New York, NY: Harcourt, 2000).
- Klein B., R. Crawford, and A. Alchian, "Vertical Integration, Appropriable Rents, and the Competitive Contracting Process," *Journal of Law and Economics* XXI (1978): 297-326.
- Kocenda, Evzen and Jan Svejnar, "The Effects of Ownership Forms and Concentration on Firm Performance after Large-Scale Privatization," WDI Working Paper #471, 2003.
- Konings, Jozef, and Patrick P. Walsh. "Disorganization in Transition Process: Firm Level Evidence from Ukraine," *Economics of Transition* VII (1999), 29-46.

- Kornai, Janos, *The Socialist System: The Political Economy of Communism* (Oxford, United Kingdom: Oxford University Press, 1992).
- La Porta, Rafael, Florencio Loper-De-Silanes, and Andrei Shleifer, "Corporate Ownership Around the World," *Journal of Finance* LVI (1999), 471-517.
- Maddala, G.S., *Limited-dependent and Qualitative Variables in Econometrics*. (Cambridge, United Kingdom: Cambridge University Press, 1983).
- Marin, Dalia, and Monika Schnitzer, *Contracts in Trade and Transition* (Cambridge, MA: MIT Press, 2002).
- Marin, Dalia, and Monika Schnitzer, "Disorganization and Financial Collapse," *European Economic Review*, forthcoming in 2005.
- Marschak, J., and W.H. Andrews, "Random Simultaneous Equations and the Theory of Production," *Econometrica* XII (1944), 143-205.
- Morreira, Marcelo J., "A Conditional Likelihood Ratio Test for Structural Models," *Econometrica* LXXI (2003), 1027-1048.
- Olson, Mancur, *Power and Prosperity: Outgrowing Communist and Capitalist Dictatorships* (New York, NY: Basic Books, 2000).
- Orlov, Alexander, "The Chaps from the Donetsk Group," *Ukrainian Pravda*, 16 December 2002, Kiev, Ukraine.
- Pappe, Yakov, *Oligarchs: Economic Chronicle 1992-2000* (Moscow, Russia: New Economic School at the Moscow State University, 2000 [in Russian]).
- Perotti, Enrico and Stansilav Gelfer, "Red Barons or Robber Barons? Governance and Investment in Russian Financial-Industrial Groups," *European Economic Review* XLV (2001), 1601-1617.
- Pissarides, Francesca, Miroslav Singer, and Jan Svejnar, "Objectives and Constraints of Entrepreneurs: Evidence from Small and Medium Size Enterprises in Russia and Bulgaria," *Journal of Comparative Economics* XXXI (2003), 503-531.
- Recanatini, Francesca, and Randi Ryterman, "Disorganisation or Self-Organization," FEEM Working Paper No.26.00, 2000.
- Roland, Gerard, and T. Verdier, "Transition and the Output Fall," *Economics of Transition* VII (1999), 1-28.
- Samphantharak, Krislert, "Internal Capital Markets in Business Groups," mimeo, 2003.
- Shleifer, Andrei and Daniel Treisman, "A Normal Country: Russia after Communism," *Journal of Economic Perspectives*, forthcoming in 2005.
- Stiglitz, Joseph, "Wither Reforms? Ten Years of the Transition," ABCDE conference, Washington, DC: World Bank, 1999.
- Stock, James H., Johnathan H. Wright, and Motohiro Yogo, "A Survey of Weak Instruments and Weak Identification in Generalized Methods of Movements," *Journal of Business and Economic Statistics* XX (2002), 518-529.
- Tybout, James R. and M. Daniel Westbrook, "Scale Economies as a Source of Efficiency Gains," in Mark J. Roberts and James R. Tybout, eds., *Industrial Evolution in Developing Countries* (Oxford, United Kingdom: Oxford University Press, 1996).
- Vella, F. and M. Verbeek, "Estimating and Interpreting Models with Endogenous Treatment Effects," *Journal of Business and Economic Statistics* XVII (1999), 473-478.
- Wooldridge, Jeffrey, *Econometric Analysis of Cross Section and Panel Data* (Cambridge, MA: MIT Press, 2002).

## VI. APPENDIX

### Proof of Proposition 1.

1. To keep  $f(\delta^* - a_i/(1+a_i)) < \infty$ , the optimal looting trivially satisfies  $\delta^* < a_i/(1+a_i)$ .
2. After taking derivative from (2) observe that  $\frac{\partial \delta^*}{\partial a_i} = \frac{1}{(1+a_i)^2} + \frac{1}{f''(\delta^* - a_i/(1+a_i))} \tau C_i > 0$  by assumptions imposed on the penalty function.
3. After taking derivative from (2) observe that  $\frac{\partial \delta^*}{\partial S_i} = \frac{\tau}{f''(\delta^* - a_i/(1+a_i))} > 0$  by assumptions imposed on the penalty function.
4. After taking derivative from (4) observe that the larger the fee/penalty for looting firms, the less attractive looting is, i.e.,  $\partial \Delta_i / \partial \phi = -1 < 0$ . The proof for  $f$  follows by analogy.
5. After taking derivative from (4) observe that by the envelope theorem  $\partial \Delta_i / \partial \tau = \delta^* S_i > 0$

QED

### Proof of Proposition 2.

1. Suppose that firm equity capital  $K_i$  is proportional to sales  $S_i$ :  $\kappa K_i = S_i$ . Then return on capital (ROC) is

$$\begin{aligned}
 ROC &= \frac{\delta_i^* S_i \tau + (1-\tau) \frac{a_i}{1+a_i} S_i - f(\delta_i^* - a_i/(1+a_i)) - \phi}{K_i} = \\
 &= \left[ \kappa \delta_i^* \tau - \kappa \frac{f(\delta_i^* - a_i/(1+a_i)) + \phi}{S_i} \right] + \kappa (1-\tau) \frac{a_i}{1+a_i}. \quad (A.1)
 \end{aligned}$$

The second term in (A.1) is the ROC received by a transparent owner. As long as the first term is positive the oligarch is looting firms. By the envelope theorem, the derivative of the first term with respect to  $S_i$  is  $\frac{1}{S_i^2} [f(\delta_i^* - a_i/(1+a_i)) + \phi] > 0$ . Hence, the oligarch's ROC is increasing in the firm size. In contrast, the firm size is irrelevant for the ROC of a transparent owner.

2. Both the oligarch and the transparent owner have ROC increasing in  $a_i$  through the second term in (A.1). By the envelope theorem, the derivative of the first term in (A.1) with respect to  $a_i$  is

$$\frac{\kappa\phi}{(1+a_i)^2 C_i} + \frac{\kappa \left[ f'(\delta_i^* - a_i/(1+a_i)) + (1+a_i) f(\delta_i^* - a_i/(1+a_i)) \right]}{(1+a_i)^3 C_i} > 0.$$

Hence, the first term in (A.1) is increasing in productivity  $a_i$ . It follows that the oligarch's return is weakly larger than the ROC of the transparent owner

QED

### Proof of Proposition 3.

To simplify notation, we suppress firm index  $i$ . Suppose in the no-investment case, the oligarch chooses to loot the firm. His benefit function under no-investment case is

$$B_1^* = \delta_1^* (1+a_1)C + (1-\tau) \left( (1-\delta_1^*)(1+a_1) - 1 \right) C - f \left( \delta_1^* - \frac{a_1}{1+a_1} \right) - 1_{\delta > 0} \phi, \quad (\text{A.2})$$

where  $\delta_1^* = \delta^*(a_1)$ . With investment the benefit is

$$B_2^* = \delta_2^* (1+a_2)C + (1-\tau) \left( (1-\delta_2^*)(1+a_2) - 1 \right) C - f \left( \delta_2^* - \frac{a_2}{1+a_2} \right) - 1_{\delta > 0} \phi - \chi C, \quad (\text{A.3})$$

where  $\delta_2^* = \delta^*(a_2)$ . After subtracting optimized (A.2) from (A.3) and using the definition for  $\Delta$  in (4), we have:

$$\begin{aligned} B_2^* - B_1^* &= \left[ (1-\tau)(a_2 - a_1) - \chi \right] C + \\ &\quad + \tau C (\delta_2^* (1+a_2) - \delta_1^* (1+a_1)) + f \left( \delta_1^* - \frac{a_1}{1+a_1} \right) - f \left( \delta_2^* - \frac{a_2}{1+a_2} \right) = \\ &= \left[ (1-\tau)(a_2 - a_1) - \chi \right] C + \left[ \Delta_2 - \Delta_1 \right]. \end{aligned} \quad (\text{A.4})$$

The first term in (A.4) is the change in after-tax profit of the transparent owner who makes the investment if  $(1-\tau)(a_2 - a_1) - \chi > 0$ . The second term is specific to the looting oligarch. Note that by the envelope theorem (4)

$$\partial \Delta / \partial a = \tau \delta^* C + (1+a)^{-2} f'(\delta^* - a/(1+a)) > 0.$$

Hence, the second term is always positive. If the transparent owner makes the investment, the oligarch also makes the investment. There are constellations of  $a_1, a_2, \chi$  (e.g.,  $a_1, a_2, \chi: a_2 = a_1 + (1-\tau)^{-1} \chi$ ) such that the oligarch makes the investment when the transparent owner does not.

QED

**Proof of Proposition 4.**

The looting oligarch pays  $T_i = \tau \left[ (1-\delta_i^*)(1+a_i) - 1 \right] C$  in taxes while the transparent owner pays  $T_i = \tau a_i C$ . Observe that the integrating oligarch pays more in taxes than the non-integrating transparent owner if and only if  $(1-\delta_2^*)(1+a_2) - 1 \geq a_1 > (1-\delta_1^*)(1+a_1) - 1$ . Hence it is sufficient to show that  $(1-\delta_i^*)(1+a_i)$  is increasing in  $a_i$ . Using results from Proposition 1, observe that

$$\begin{aligned} \frac{\partial}{\partial a_i} (1-\delta_i^*)(1+a_i) &= (1-\delta_i^*) - (1+a_i) \frac{\partial \delta_i^*}{\partial a_i} = \\ &= (1-\delta_i^*) - (1+a_i) \left( \frac{1}{(1+a_i)^2} + \frac{\tau C_i}{f''(\delta_i^* - a_i/(1+a_i))} \right) = \\ &= - \left( \delta_i^* - \frac{a_i}{1+a_i} \right) - \frac{\tau(1+a_i)C_i}{f''(\delta_i^* - a_i/(1+a_i))} = \text{(use the first order condition for } \delta_i^*) \\ &= - \left( \delta_i^* - \frac{a_i}{1+a_i} \right) - \frac{f'(\delta_i^* - a_i/(1+a_i))}{f''(\delta_i^* - a_i/(1+a_i))} = \\ &= - \left( \delta_i^* - \frac{a_i}{1+a_i} \right) \left( 1 + \frac{1}{\varepsilon} \right). \end{aligned}$$

where  $\varepsilon = (\delta_i^* - a_i/(1+a_i)) \frac{f''(\delta_i^* - a_i/(1+a_i))}{f'(\delta_i^* - a_i/(1+a_i))}$  is the elasticity of the marginal penalty for looting.

Note that by Proposition 1.1,  $-(\delta_i^* - a_i/(1+a_i)) > 0$ . Hence,  $\partial T_i / \partial a_i > 0$  if and only if  $\varepsilon < -1$ , that is, the marginal penalty is elastic.

Now provided that  $\frac{\partial}{\partial a_i}(1-\delta_i^*)(1+a_i)$  is positive and bounded away from zero, for a sufficiently large  $a_2$  we will have  $(1-\delta_2^*)(1+a_2)-1 > a_1$  and, thus, the looting and investing oligarch will generate higher tax revenues than the transparent non-investing owner.

QED

**Proof of Proposition 5.**

1) Note that in the case of the transparent owner the change in the profit is equal to

$$\begin{aligned}\Delta^L &= \pi_I - \pi_D - \pi_U - \chi C_U = \\ &= (1-\tau)a_I C_U - (1-\tau)a_D(1+a_U)C_U - (1-\tau)a_U C_U - \chi C_U = \\ &= C_U [(1-\tau)(a_I - a_U - a_D - a_D a_U) - \chi].\end{aligned}$$

In the case of the oligarch, the change in the benefit is equal to

$$\begin{aligned}\Delta^O &= B_I - B_D - B_U - \chi C_U = \\ &= C_U [(1-\tau)(a_I - a_U - a_D - a_D a_U) - \chi] + \\ &\quad + [\phi + f(\delta_D^* - a_D/(1+a_D)) + f(\delta_U^* - a_U/(1+a_U)) - f(\delta_I^* - a_I/(1+a_I))] + \\ &\quad + \tau C_U (\delta_I^*(1+a_I) - \delta_U^*(1+a_U) - \delta_D^*(1+a_D)(1+a_U)).\end{aligned}\tag{A.5}$$

Hence,

$$\begin{aligned}\Delta^O - \Delta^L &= [\phi + f(\delta_D^* - a_D/(1+a_D)) + f(\delta_U^* - a_U/(1+a_U)) - f(\delta_I^* - a_I/(1+a_I))] + \\ &\quad + \tau C_U (\delta_I^*(1+a_I) - \delta_U^*(1+a_U) - \delta_D^*(1+a_D)(1+a_U)).\end{aligned}$$

We first prove that this expression is positive for the case when  $a_I = a_U + a_D + a_D a_U$  and then show that this expression is increasing in  $a_i$ . Note that by (2) we have

$$\delta_{I'}^* - \frac{a_{I'}}{1+a_{I'}} = f'^{-1}(\tau S_{I'}) = f'^{-1}(\tau S_D) = \delta_D^* - \frac{a_D}{1+a_D}. \text{ Thus the first expression is necessarily positive.}$$

To prove that the second term is positive, note that  $\delta_{I'}^* = \delta_D^* + \frac{a_{I'}}{1+a_{I'}} - \frac{a_D}{1+a_D}$  and  $\delta_U^* < a_U/(1+a_U)$

and, thus,

$$\begin{aligned}
& \delta_I^*(1+a_I) - \delta_U^*(1+a_U) - \delta_D^*(1+a_D)(1+a_U) = \\
& = \left( \delta_D^* + \frac{a_I}{1+a_I} - \frac{a_D}{1+a_D} \right) (1+a_D)(1+a_U) - \delta_U^*(1+a_U) - \delta_D^*(1+a_D)(1+a_U) > \\
& > \left( \frac{a_I}{1+a_I} - \frac{a_D}{1+a_D} \right) (1+a_D)(1+a_U) - \frac{a_U}{1+a_U}(1+a_U) = \\
& = \frac{1}{(1+a_D)(1+a_U)+1} > 0.
\end{aligned}$$

We conclude that  $\Delta^O - \Delta^L > 0$  for  $a_I = a_U + a_D + a_D a_U$ . By the envelope theorem, we have

$$\frac{\partial}{\partial a_I} \{ \Delta^O - \Delta^L \} = \frac{\partial}{\partial a_I} \left\{ \tau \delta_I^*(1+a_I) C_U - f \left( \delta_I^* - a_I / (1+a_I) \right) \right\} > 0. \text{ Hence, } \Delta^O - \Delta^L > 0 \text{ for } a_I > a_I$$

and, thus, the oligarch has greater incentives to integrate firms.

2) The change in the tax revenues is

$$\begin{aligned}
\Delta T &= \tau C_U \left[ (1 - \delta_I^*)(1+a_I) - 1 \right] - \tau C_U \left[ (1 - \delta_U^*)(1+a_U) - 1 \right] - \tau C_U \left[ (1 - \delta_D^*)(1+a_D) - 1 \right] (1+a_U) = \\
&= \tau C_U \left[ (1 - \delta_I^*)(1+a_I) - (1 - \delta_D^*)(1+a_D) \right] + \tau C_U \left[ \delta_U^*(1+a_U) - (1 - \delta_D^*)(1+a_D) a_U \right].
\end{aligned}$$

From Proposition 4, we know that the necessary and sufficient condition for the first term to be positive is the elastic marginal penalty for looting. The second term is always negative because

$$\begin{aligned}
& \delta_U^*(1+a_U) - (1 - \delta_D^*)(1+a_D) a_U = \delta_U^*(1+a_U) + \delta_D^* a_U (1+a_D) - (1+a_D) a_U < \\
& < \frac{a_U}{1+a_U} (1+a_U) + \frac{a_D}{1+a_D} a_U (1+a_D) - (1+a_D) a_U = 0.
\end{aligned}$$

where we use  $\delta_i^* < a_i / (1+a_i)$  (see Proposition 1). Hence, the elastic marginal penalty is the necessary condition for the ‘‘oligarch’’ integration to generate larger tax revenues so that for a sufficiently large gain in productivity the integrating oligarch pays more in taxes than the non-investing transparent owner.

QED

### **Proof of Proposition 6.**

Following Hart's (1995), we assume that downstream firm can make revenue increasing investment  $i$  and upstream firm can make cost enhancing investment  $e$ . We use subscripts  $I$ ,  $D$ , and  $U$  to denote GHM-ideal (i.e., when parties have access to each other's human and physical capital), downstream agent and upstream agent cases. In addition to our standard set of assumptions, suppose that

investments are observable by an owner but not verifiable. In such circumstances, the owner is able to decide on maximum investment budget for each of the firms but delegates the investment picking to an agent. Further, assume that an agent's compensation is directly proportional to total profits of the firm he manages, so that he is motivated to maximize the latter when picking investment projects. Our set of assumptions should also include those of the basic GHM model: the sales of downstream firm  $S_I(i)$ ,  $S_D(i)$ ,  $S_U(i)$  and cost of upstream firm  $C_I(e)$ ,  $C_D(e)$ ,  $C_U(e)$  are well-behaved—i.e.,  $S_k(i) \in C^2$ ,  $\frac{\partial S_k(i)}{\partial i} > 0$ ,  $\frac{\partial^2 S_k(i)}{\partial i^2} < 0$  and  $C_k(e) \in C^2$ ,  $\frac{\partial C_k(e)}{\partial e} < 0$ ,  $\frac{\partial^2 C_k(e)}{\partial e^2} > 0$  for  $k=U, D, I$ —and ideal integration dominates other forms of integration, i.e.,

$$S_I(i) > \max \{S_D(i), S_U(i)\}, \frac{\partial S_I(i)}{\partial i} > \max \left\{ \frac{\partial S_D(i)}{\partial i}, \frac{\partial S_U(i)}{\partial i} \right\} \quad \forall i,$$

$$C_I(e) < \min \{C_D(e), C_U(e)\}, \frac{\partial C_I(e)}{\partial e} < \max \left\{ \frac{\partial C_D(e)}{\partial e}, \frac{\partial C_U(e)}{\partial e} \right\} \quad \forall e.$$

Obviously, upstream and downstream firms can make at most a profit of

$$\pi_I = \max_{i,e} \{S_I(i) - C_I(e) - i - e\}. \quad (\text{A.6})$$

The first order condition for (A.6) with respect to  $i$  and  $e$  gives:

$$\frac{\partial S_I(i)}{\partial i} - 1 = 0, \quad (\text{A.7})$$

$$\frac{\partial C_I(e)}{\partial e} + 1 = 0. \quad (\text{A.8})$$

Hart (1995) shows that levels of investment determined by (A.7) and (A.8) are not attainable because under any form of ownership agents do not have full access to and control over human and physical capital of other members of the group, e.g. the upstream firm does not enjoy full control over all assets of the downstream firm. Hence, upstream or downstream integration results in suboptimal levels of investment and by monotonicity of cost and revenue functions we, therefore, have at the respective optimal investments

$$\frac{\partial S_D(i)}{\partial i} < \frac{\partial S_I(i)}{\partial i} \leq 1 \quad \forall i, \quad (\text{A.9})$$

$$\frac{\partial C_D(e)}{\partial e} > \frac{\partial C_I(e)}{\partial e} \geq -1 \quad \forall e. \quad (\text{A.10})$$

Now let us turn to the analysis of revenue increasing investment and the behavior of the downstream firm. The oligarch's revenue in tax havens is  $\delta_D(i)S_D(i)$ . The downstream firm faces the following profit function:

$$\pi_I^D = (1 - \delta_D(i)) \cdot S_D(i) - C_D - i - f(\delta_D(i) - a_D / (1 + a_D)) - \phi.$$

The first order condition with respect to  $i$  yields:

$$-\frac{\partial S_D(i) \cdot \delta_D(i)}{\partial i} - \frac{\partial f}{\partial \delta} \cdot \frac{\partial \delta_D}{\partial i} = 1 - \frac{\partial S_D(i)}{\partial i}. \quad (\text{A.11})$$

The first term in the left hand side of (A.11) is the oligarch's marginal gain in looting revenue from investment (the optimizing oligarch can operate only on a range of  $i$  such that  $\delta_D(i)S_D(i)$  is increasing in  $i$ ); thus, this term is always non-negative. By assumptions of the problem and (A.9), the right hand side is always non-negative. We also know that  $\partial f / \partial \delta > 0$  by assumptions imposed on the penalty function  $f$ . Hence,  $\partial \delta_D(i) / \partial i$  must be less than zero to have an interior well-defined solution to profit maximization problem. Denote the solution to (A.7) with  $i^*$ . Provided  $\partial \delta_D(i) / \partial i < 0$  and  $\delta_D(i^*) \in [0, a(i^*) / (1 + a(i^*))]$ , the oligarch, by choosing appropriate functional form for  $\delta_D(i)$ , can induce the downstream firm to make the first best level of investment  $i^*$ . Thus, the oligarch can achieve an outcome that is not attainable under either upstream or downstream integration. By the symmetry of the problem, the same results can be shown for cost enhancing investment and the upstream firm. We conclude that the oligarch achieve superior outcomes in the GHM setup.

QED.

Table 1. Distribution of the oligarch ownership by oligarchic groups and industries, 2002.

Oligarchic group	Energy	Metal	Chemical	Machine building	Light and food	Service	Total
Industrial Union of Donbass (Taruta-Mkrchan)	0	7	0	9	0	0	16
InterProduct (Leschinskiy)	1	0	0	2	13	0	16
System Capital Management (Akhmetov)	6	16	6	49	40	1	118
Dynamo (Surkis-Medvedchuk)	3	2	1	3	3	0	12
Pryvat (Kolomoyskiy)	1	9	2	5	1	2	20
Bipe (Pinchuk)	0	4	0	2	5	0	11
InterContact (Yedin)	1	0	0	4	2	0	7
PromInvest (Poroshenko)	2	0	0	5	5	0	12
Aval (Shpyg)	1	0	0	9	9	1	20
UkrSotsBank (Khoroshkovskiy)	0	0	0	2	1	0	3
Brinkford/Orlan (Zhvania/Chervonenko)	0	0	0	2	0	0	2
UkrSibBank (Yaroslavskiy)	0	2	3	13	8	1	27
Finance&Credit (Kucherenko)	0	0	2	9	1	0	12
<b>Total</b>	<b>15</b>	<b>40</b>	<b>14</b>	<b>114</b>	<b>88</b>	<b>5</b>	<b>276</b>

Note: The table reports the number of firms that belong to an oligarchic group in a given industry in our sample. Names of the corporate characters are in the parentheses.

Table 2. Descriptive statistics.

Variable	Owned by oligarchs		Not owned by oligarchs	
	Mean, number	st.dev.	Mean, number	st.dev.
<b>Year 2002, thousand UAH</b>				
Number of employees	1,520	3,027	514	1,917
Capital assets	69,471	169,268	21,473	98,514
Gross profit margin	12,957	41,005	4,027	39,556
Value added	38,894	104,085	10,686	65,232
Total assets	138,997	339,880	38,252	180,287
<b>Year 1993, thousand coupons</b>				
Number of employees	1,923	3,079	874	2,039
Capital assets	41,679	101,712	11,534	51,289
Profit	23,732	66,698	5,681	28,084
Value added	77,923	170,922	29,123	96,151
<b>Regional distribution</b>				
West	68		491	
East	110		431	
North-Center	54		428	
South	32		224	
Kyiv	12		67	
<b>Industry distribution</b>				
Energy	15		121	
Metal	40		48	
Chemical	14		52	
Machine building	114		814	
Light and food	88		550	
Service	5		56	
<b>Number of observations</b>	276	14.4%	1,641	85.6%

Note: ownership criteria are described in the text.

Table 3. First stage/Selection equation. Probit estimates.

regressor	Oligarch dummy
(1)	(2)
Log(Capital <sup>(93)</sup> )	0.115** (0.048)
Log(Sales <sup>(93)</sup> )	0.162*** (0.042)
Log(Labor <sup>(93)</sup> )	-0.073 (0.057)
East	0.161 (0.101)
South	-0.034 (0.119)
North-Center	-0.086 (0.100)
Kyiv	0.097 (0.183)
Metals	0.996*** (0.193)
Chemical	0.616*** (0.227)
Machine building	0.533*** (0.158)
Light&food	0.655*** (0.178)
Services	0.369 (0.262)
Observations	1917
LR $\chi^2(12)$	135.10
Pseudo-R <sup>2</sup>	0.088

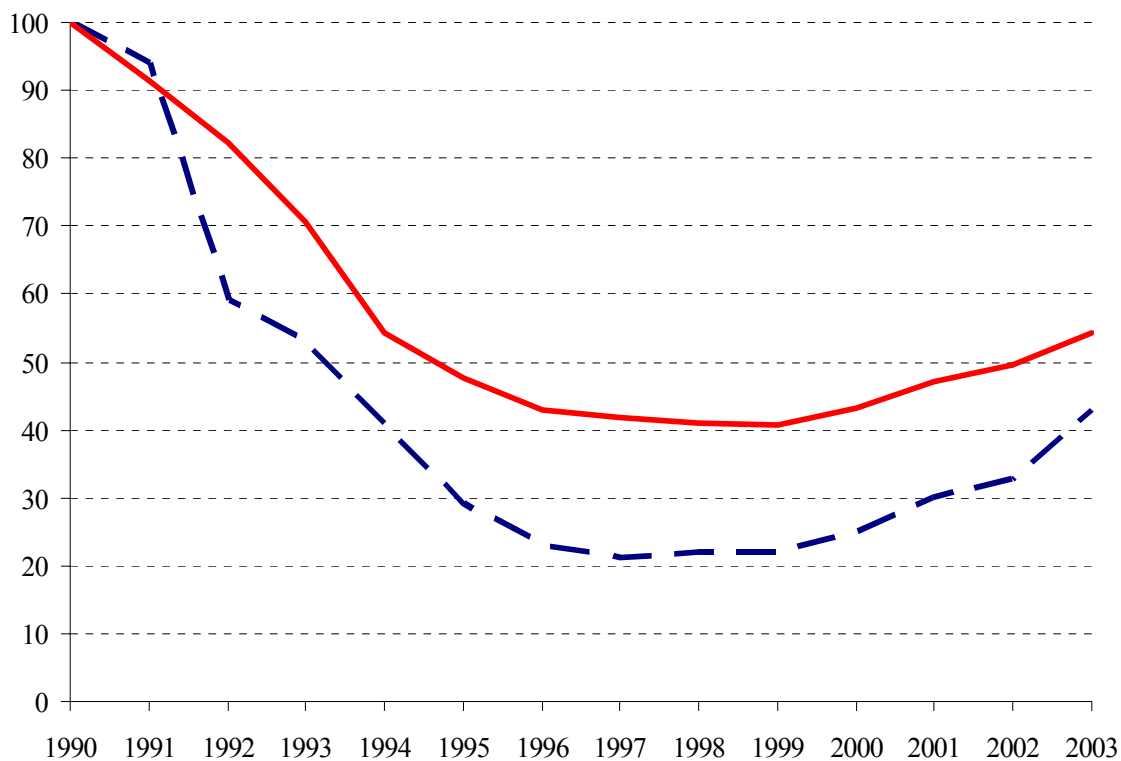
Note: The table presents estimates of specification (7). Dependent variable is the *OLIGARCH* dummy, which is one if an oligarch owns a firm and zero otherwise. Robust standard errors are in parentheses. Omitted industry is energy. Omitted region is west. Definitions of the variables are in the text. \*, \*\*, \*\*\* significant at 10%, 5%, and 1% respectively.

Table 4. Production function.

Regressor	OLS	IV	TE 2-Step	TE
(1)	(2)	(3)	(4)	(5)
OLIGARCH	0.078 (0.068)	0.638** (0.276)	0.563** (0.284)	0.691*** (0.181)
Dlog(Capital)	0.090*** (0.035)	0.084** (0.036)	0.095*** (0.035)	0.097*** (0.036)
Dlog(Labor)	1.193*** (0.027)	1.180*** (0.036)	1.189*** (0.027)	1.189*** (0.035)
Metal	0.504*** (0.141)	0.312** (0.159)	0.339** (0.171)	0.295** (0.141)
Chemical	0.279* (0.154)	0.213 (0.177)	0.229 (0.158)	0.217 (0.174)
Machine building	0.286*** (0.095)	0.268** (0.107)	0.279*** (0.096)	0.278*** (0.106)
Light&food	0.231** (0.096)	0.215** (0.109)	0.217** (0.097)	0.213** (0.108)
Service	0.909*** (0.158)	0.915*** (0.191)	0.919*** (0.160)	0.922*** (0.191)
Kyiv	0.545*** (0.117)	0.534*** (0.126)	0.536*** (0.119)	0.533*** (0.126)
Observations	1917	1917	1917	1917
R <sup>2</sup>	0.58	0.57		
First stage F-statistic		73.95		
AR statistic		4.83		
Hausman test: p-value		0.02		
$\rho(\varepsilon_i, u_i)$			-0.271	-0.339***
Wald $\chi^2(15)$			2829.86	1984.64
LogL				-3571.32

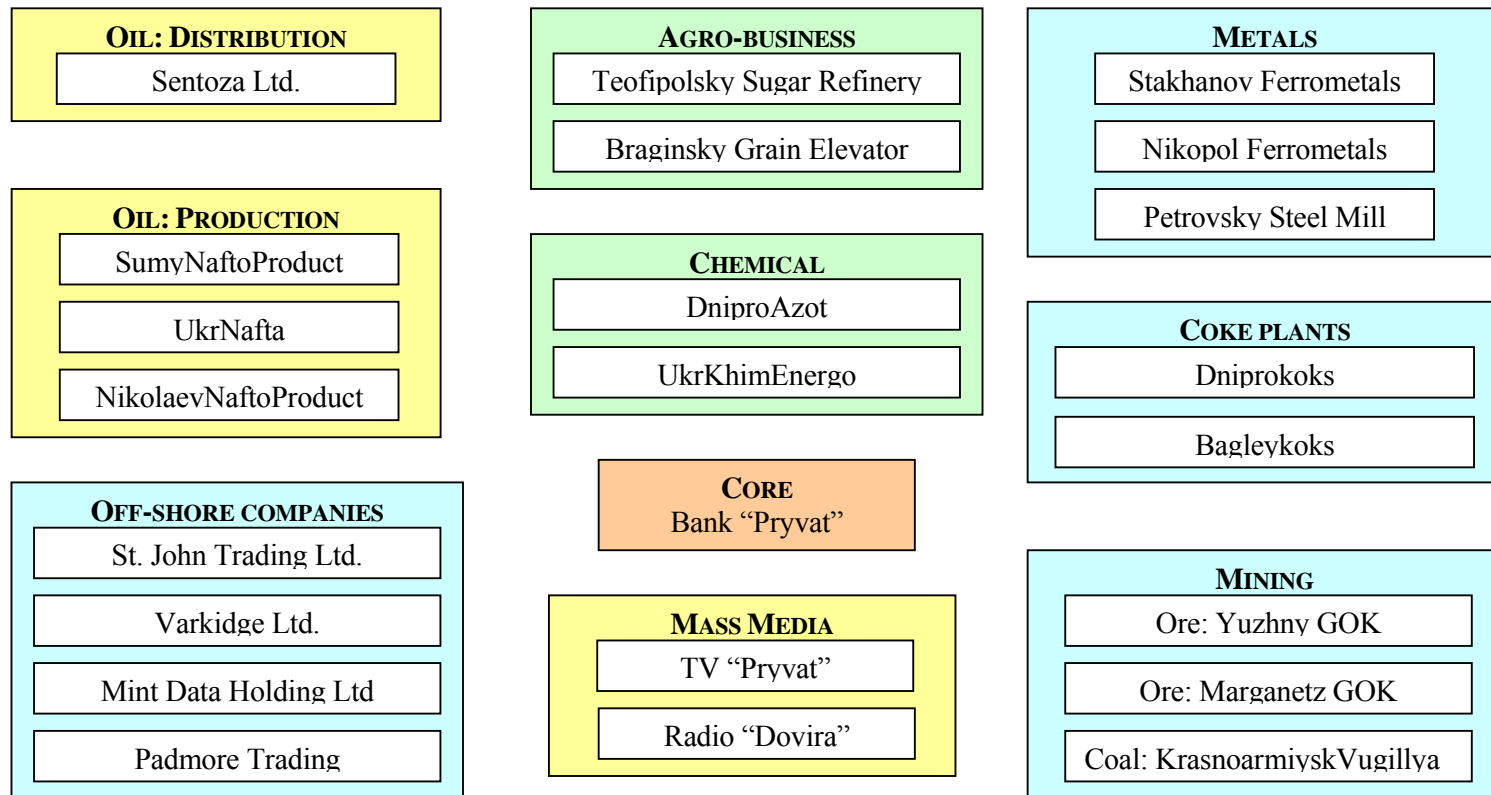
Note: The table presents estimates of specification (8). Dependent variable is the change in log value added between 1993 and 2002. IV and TE are instrumental variables and treatment effects estimators, respectively. Robust standard errors are in parentheses. Omitted industry is energy. Definitions of the variables are in the text. \*, \*\*, \*\*\* significant at 10%, 5%, and 1% respectively. AR is the Anderson-Rubin statistic with critical values computed as in Moreira (2003). Critical value for the AR statistic are 3.84 and 5.41 for 5% and 1%, respectively (500 simulations).

Figure 1. Indices of gross domestic product, investment and manufacturing.



Note: solid denotes GDP, long-dash denotes the index of investment in plant, equipment, and structures. Source: State Statistics Committee of Ukraine.

Figure 2. Simplified corporate structure of oligarchic group “Pryvat”.



Note: adopted from Investgazeta (2003).