

# Obfuscating Ownership\*

John S. Earle  
George Mason University

Scott Gehlbach  
University of Chicago

Anton Shirikov  
University of Wisconsin–Madison

Solomiya Shpak  
George Mason University

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## Abstract

When property rights are weak, wealthy individuals may obscure their ownership of assets through proxy frontmen, related individuals, shell companies, and offshore firms. We formally examine the decision of such “oligarchs” to obfuscate ownership to protect property from legal assault and confiscatory taxation, emphasizing that both the benefits and costs of obfuscation may be greater for oligarchs with better political connections. We explore these relationships empirically in a study of Ukraine around the time of the Orange Revolution. Combining information from investigative journalists on control of over 300 key enterprises with rich data on formal ownership ties, and employing various strategies for identification, we find that oligarchs who were in the opposition before the Orange Revolution were more likely to obscure ownership through various mechanisms. Moreover, oligarchs who had been closely connected to the regime prior to the Orange Revolution reversed behavior afterward, turning to foreign entities to protect their suddenly vulnerable assets. Exploiting presumed geographic variation in political connections, we find similar patterns in a larger sample of over 14,000 firms.

**JEL Codes:** D23, G32, P26

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Protection of property from predation and expropriation is widely understood as a necessary condition for investment and economic growth (e.g., North, 1981; Olson, 1993; Acemoglu and Johnson, 2005). In the traditional understanding, the state provides such protection as a public good (e.g., Bueno de Mesquita and Root, 2000; North, Wallis and Weingast, 2009). Without overturning this view, recent work—much of it inspired by the experience of formerly socialist countries—has emphasized the proactive measures that asset owners, often connected to those in power, can take to protect their property.<sup>1</sup> Such strategies include forming alliances with politicians (Shleifer, 1997; Markus and Charnysh, 2017) and stakeholders such as foreign investors and neighboring communities (Markus, 2015), seeking political office (Gehlbach, Sonin and Zhuravskaya, 2010; Szakonyi, 2018), accepting the protection of the mob and other “violent entrepreneurs” (Frye and Zhuravskaya, 2000; Volkov, 2002), and doing “good works” to influence the perceived legitimacy of property rights (Frye, 2006, 2017).<sup>2</sup>

Mostly absent from this discussion is what may be the most obvious strategy of all. When someone wants to take something from you, the natural tendency is to hide it. As the recent exposure of the Panama and Paradise Papers has illustrated, wealthy individuals often obscure ownership of productive assets through frontmen and related individuals, shell companies, and offshore firms. Such behavior may truly conceal the beneficial owners of an enterprise. Alternatively, it may imply “hiding in plain sight”: even when it is common knowledge that assets are under the control of particular individuals, by creating an obscure

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<sup>1</sup>Implicit in such analysis is the assumption that property-rights protection can be provided selectively; see Haber, Razo and Maurer (2003). Razo (2008) suggests that such protection is facilitated by the mutual connectedness of political officials and economic actors—a perspective that anticipates our focus on groups of oligarchs with similar political affiliations.

<sup>2</sup>Related work emphasizes that the public provision of property rights is meaningless if private entrepreneurs do not take advantage of it. See, e.g., Hendley et al. (1997); Hendley, Murrell and Ryterman (2001); and Gans-Morse (2017*a,b*).

target and involving other jurisdictions, such machinations can raise the cost of seizing property through legal assault or confiscatory taxation.

Although obfuscating ownership can help to protect property rights, it comes at a cost. In addition to the direct expense of paying lawyers and bankers for their time and agreement not to disclose the arrangement, elaborate ownership networks may complicate restructuring and reduce access to finance, thus preventing the best use of assets. Owners who obfuscate ownership may also subject themselves to legal and reputational risk, to the extent that such arrangements can be discovered.

As we discuss with the help of a simple decision-theoretic model, both the benefits and costs of obfuscating ownership may be larger for some owners than for others. In particular, owners connected to the incumbent regime through formal and informal ties may have less need to obfuscate, as they can rely on other means of protection. At the same time, the legal risk that accompanies obfuscation may be less pronounced for connected owners, as they are insulated from investigation and prosecution. Connected owners may also be able to rely on politically directed credits, reducing the need for transparency.

Which strategies of obfuscating ownership are most common, and who is most likely to pursue them? We address these questions empirically with a study of the ownership patterns of Ukrainian “oligarchs” in the period just before and after the Orange Revolution of 2004—an environment of generally weak protection of property rights and unexpected political turnover, as Viktor Yushchenko won the presidency over President Leonid Kuchma’s designated successor, Viktor Yanukovich.<sup>3</sup> To do so, we exploit data from firm registries and business journalists to identify the ownership chains of over 300 of the most important enterprises in Ukraine. We characterize these chains along various dimensions related to the transparency of ownership, including whether an oligarch is himself in the (observable)

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<sup>3</sup>Guriev and Rachinsky (2005, p. 132) discuss historical versus contemporary usage of the term “oligarch.” Implicitly, we follow their definition of an oligarch as a “tycoon,” or a “businessman... who controls sufficient resources to influence national politics.”

ownership chain; the distance to the oligarch, when present; and whether the chain includes a foreign or “offshore” firm.

We are especially interested in comparing the ownership patterns of oligarchs who were more or less connected to the incumbent regime (“Blue” and “Orange” oligarchs, respectively). As we discuss above, and as we demonstrate formally below, such connections may have either decreased or increased the incentive to obfuscate. In principle, one could adjudicate between these two possibilities by regressing firm-level measures of obfuscation on the political connections of the controlling oligarch. In practice, political connections are measured imperfectly and may be endogenous to the decision to obfuscate.

We employ two distinct, complementary empirical strategies to identify the effect of political connections on the decision to obfuscate ownership. First, taking advantage of Ukraine’s sharply defined political and economic geography, whereby both oligarch groups and political parties are concentrated in particular regions (Hale, 2005; Earle and Gehlbach, 2015; Makarin and Korovkin, 2018), we instrument the (measured) political connections of a controlling owner on the vote for Viktor Yushchenko (the winning presidential candidate in 2004) in the province (*oblast’*) where the firm is located. Second, we exploit the time variation provided by the Orange Revolution to compare the change in obfuscation among Blue and Orange firms from 2004 to 2006, on the assumption that establishing and breaking political connections have frictions, so that connections formed before the Orange Revolution could not be immediately or credibly changed in the period after.

The empirical estimates from these exercises are consistent with our hypothesis that political connections are related to obfuscation. We find a negative relationship: firms controlled by Orange oligarchs in early 2004 are substantially more likely to absent themselves from the ownership chain and perhaps to have an owner registered abroad. The former relationship especially is precisely estimated and robust to instrumenting political connections on vote for Yushchenko in the firm’s province. Furthermore, we find that the sudden political turnover resulting from the Orange Revolution created a reversal in the patterns, as firms

controlled by Blue oligarchs (who lost their connections) added foreign owners, including offshore-registered vehicles.

We supplement this analysis of the behavior of oligarch-controlled enterprises, for which we observe political connections directly, with a study of over 14,000 joint stock companies during the same period. Inferring political connections from the firm’s geographic location—more “Orange” in provinces that supported Yushchenko in 2004, more “Blue” in provinces that supported his opponent Victor Yanukovych—we find qualitatively similar patterns to those in the sample of oligarch-controlled enterprises.

Our work has connections to a vast literature on the economics of property rights. The modern theory of the firm emphasizes the importance of the allocation of property rights for incentives within enterprises (Coase, 1937; Williamson, 1985; Grossman and Hart, 1986; Hart and Moore, 1990) and for bargaining between the firm and the state (Shleifer and Vishny, 1994). Most accounts, however, leave unspecified precisely *how* these rights are held. An important exception is La Porta, Lopez-de Silanes and Shleifer (1999), who document the frequent use, especially in countries with poor shareholder protections, of “pyramids”—ownership chains in which a publicly traded entity sits between a firm and its controlling shareholder. In their telling, pyramids exist as a means of separating control from cash-flow rights. Our work suggests an alternative motivation for related practices: to maintain control in an environment of poor protection of property rights. In other words, whereas La Porta, Lopez-de Silanes and Shleifer (1999) emphasize the vulnerability of minority shareholders to expropriation by controlling blockholders, we focus on the responses of controlling owners to vulnerability to predation from outside the firm. Indeed, in nearly two-thirds of the firms in our sample, we do not observe the beneficial owner *anywhere* in the ownership chain.

Our paper is also related to the burgeoning literature on firms’ political connections, with origins in the seminal work of Fisman (2001) and Faccio (2006), among others. Within that literature, our contribution relates especially to research on oligarchs and other politically connected owners in postcommunist countries, including Earle and Gehlbach (2015),

Treisman (2016), Lamberova and Sonin (2018), and Barnes (2019). Guriev and Rachinsky (2005) and Gorodnichenko and Grygorenko (2008) in particular assemble and analyze data on oligarch-owned firms in Russia and Ukraine, respectively. Our data are different in various respects, including in that we identify ownership chains both before and after a major political shock. More fundamentally, the questions we ask of the data are different: rather than examine the relative productivity of oligarch-owned firms, we highlight a type of behavior—obfuscating ownership—that has received little previous attention, and we provide a theoretical and empirical analysis of the determinants of this behavior, with an emphasis on political connections.

Our work is also related to the growing literature on economic inequality, including how wealthy individuals hide their assets through offshores and opaque chains of ownership. Journalists have mined such sources as the Panama and Paradise Papers for anecdotes on these practices (e.g., Obermayer and Obermaier, 2016), and scholars have explored the implications of offshore assets for inequality, as in Zucman (2013, 2014, 2015). Research in this tradition is focused on measuring the overall wealth distribution, whereas our paper is concerned with differences in individual behavior and trying to understand some of the motives for those differences.

The next section of the paper presents a simple theoretical framework for thinking about the decision to obfuscate ownership and its relationship to the political connections of the owner. We subsequently describe our data and the process by which we construct the ownership chains of oligarch-controlled enterprises, and we explain our empirical strategy. The results proceed from a cross-sectional analysis of obfuscation and political connections in early 2004 to a differenced analysis of changes in obfuscation from 2004 to 2006, and finally to similar analysis of the behavior of a much larger sample of joint stock companies. We conclude and discuss implications of our findings in the final section.

## 1 Theoretical framework

Consider Donetsk industrialist Rinat Akhmetov, who is Ukraine’s richest person. Prior to the Orange Revolution, Akhmetov’s System Capital Management (SCM) was established to be comparatively transparent,<sup>4</sup> with relatively short ownership chains that typically led to Akhmetov himself. In a postcommunist environment of generally abysmal corporate governance, System Capital Management stood out for its “Western” structure.

The quintessential “Blue” oligarch, Akhmetov was the chief sponsor of former Donetsk governor and current prime minister Viktor Yanukovich during the 2004 presidential campaign. Yanukovich was the presumed successor to President Leonid Kuchma, but allegations of widespread electoral fraud led to weeks of street protests and ultimately a “do-over” election in late December. Viktor Yushchenko, co-leader (with Yulia Tymoshenko) of the “Orange” forces in 2004, emerged the unexpected winner.

Given his connections to Yanukovich, Akhmetov was perceived to be at particular risk following the Orange Revolution. Prosecutors initiated a criminal investigation into Akhmetov’s possible connections with organized crime (Katchanovski, 2008), and incoming Prime Minister Tymoshenko launched a noisy campaign in favor of “reprivatization”—that is, the nationalization and subsequent privatization of previously privatized enterprises (Åslund, 2005, 2009). In apparent response to these developments, Akhmetov restructured System Capital Management through the use of offshore vehicles to obscure the ownership of his enterprises and so frustrate any attempt to seize them (Paskhaver, Verkhovodova and Ageeva, 2006).

For “Blue” oligarchs like Akhmetov, the direct and indirect costs of obfuscating ownership may have outweighed the benefits so long as they maintained connections to, and thus the protection of, those in power. System Capital Management became less transparent soon

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<sup>4</sup>Conversation with Oleksandr Martynenko, deputy chief of staff and press secretary to President Leonid Kuchma, June 2016.

after Akhmetov lost those connections—suggesting that political connections are negatively related to obfuscation. In principle, however, one could imagine the opposite relationship, as connections reduce the legal exposure and opportunity costs associated with obfuscation, in which case “Orange” oligarchs might have increased obfuscation instead.

We formalize these considerations with the following decision-theoretic model. An “oligarch” invests in a level of obfuscation  $\omega \in [0, \infty)$  to maximize

$$[1 - P(\omega; \chi)] \cdot [\pi - C(\omega; \chi)], \quad (1)$$

where  $P(\cdot)$  is the probability of successful predation by a competitor or the state,<sup>5</sup> such that the oligarch completely loses the firm, or alternatively the fraction of the firm’s value that the oligarch can expect to lose to predation;  $\chi$  measures the strength of the political connections of the oligarch;  $\pi$  is the baseline value of the firm; and  $C(\cdot)$  is the cost of obfuscation, including all legal, transaction, and opportunity costs (e.g., foregone opportunities for expansion or increasing productivity). We assume that  $P(\cdot)$  is strictly decreasing and twice continuously differentiable in  $\omega$ , with  $P_{\omega\omega} > 0$ , where subscripts denote derivatives. The assumption that predation is convex in  $\omega$  implies diminishing marginal returns to obfuscation. Similarly, we assume that  $C(\cdot)$  is strictly increasing and twice continuously differentiable in  $\omega$ , with  $C_{\omega\omega} > 0$ , such that there are increasing marginal costs of obfuscating ownership.

In general, the relationship between the optimal level of obfuscation and the political connections of the oligarch depends on the shape of the functions  $P(\cdot)$  and  $C(\cdot)$  with respect to  $\chi$ . We assume that  $P(\cdot)$  is differentiable and decreasing in  $\chi$ : connections protect the firm from predation. Also plausible is that  $P_{\omega\chi} \geq 0$ , implying that obfuscation and connections are not complementary in reducing predation (from the perspective of the oligarch). Intuitively, the marginal benefit of obfuscation may be lower for a firm with strong political protection. Alternatively, and not mutually exclusively, politicians may find it more costly to provide

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<sup>5</sup>Barnes (2019) emphasizes that the risk of predation may be greater in countries with “warring oligarchies,” as in Ukraine or Boris Yeltsin’s Russia.

protection to firms that are not transparently owned. Finally, we may anticipate that the marginal cost of obfuscation is less for oligarchs who are better connected—for example, because connected oligarchs are protected from criminal prosecution, or because access to politically directed credits reduces the benefits of transparency—which implies  $C_{\omega\chi} < 0$  and, for  $\omega > 0$ ,  $C_\chi < 0$ .

In what follows, we suppress the arguments of  $P(\cdot)$  and  $C(\cdot)$  for notational simplicity. At an interior solution, the optimal level of obfuscation  $\omega^*$  equates the marginal benefit and marginal cost of obfuscation.<sup>6</sup>

$$-P_\omega(\pi - C) = C_\omega(1 - P). \quad (2)$$

Our primary interest is in the relationship between the optimal level of obfuscation  $\omega^*$  and the oligarch's political connections  $\chi$ . To derive this, we implicitly differentiate Equation 2 with respect to  $\chi$ :

$$\begin{aligned} -P_\omega \frac{\partial \omega}{\partial \chi} (\pi - C) - P_{\omega\chi} (\pi - C) + C_\omega P_\omega \frac{\partial \omega}{\partial \chi} + C_\chi P_\omega = \\ C_{\omega\omega} \frac{\partial \omega}{\partial \chi} (1 - P) + C_{\omega\chi} (1 - P) - C_\omega P_\omega \frac{\partial \omega}{\partial \chi} - C_\omega P_\chi, \end{aligned}$$

where derivatives are evaluated at  $\omega = \omega^*$ . Rearranging gives

$$\frac{\partial \omega}{\partial \chi} = \frac{P_{\omega\chi}(\pi - C) - C_\omega P_\chi - C_\chi P_\omega + C_{\omega\chi}(1 - P)}{-P_{\omega\omega}(\pi - C) - C_{\omega\omega}(1 - P) + 2C_\omega P_\omega}.$$

By inspection, the denominator of this expression is negative. The numerator, in contrast, is of uncertain sign. The first two terms,

$$P_{\omega\chi}(\pi - C) - C_\omega P_\chi > 0,$$

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<sup>6</sup>To see that this is sufficient for a solution, observe that the second derivative of Expression 1 with respect to  $\omega$  is

$$-P_{\omega\omega}(\pi - C) + P_\omega C_\omega - C_{\omega\omega}(1 - P) + P_\omega C_\omega,$$

which is strictly less than zero, given that  $P$  is strictly decreasing and convex in  $\omega$  and that  $C$  is strictly increasing and convex in  $\omega$ .

represent the substitutability of obfuscation and connections. In contrast, the latter two terms,

$$-C_{\chi}P_{\omega} + C_{\omega\chi}(1 - P) < 0,$$

represent their complementarity.

Ultimately, the relationship between obfuscation and political connections is an empirical question, though the analysis here suggests interpretations of each possible result. If, as the example of Rinat Akhmetov suggests, better connected oligarchs obfuscate less—implying a relationship of substitutes—then our model implies that the impact of connections on the risk of predation is large relative to the effect of connections on the cost of obfuscation. When oligarchs with better connections obfuscate more, the converse is true, and obfuscation and political connections are complements in protecting against predation. In the following sections we describe the data and empirical strategy we use to estimate this relationship.

## 2 Identifying and characterizing ownership chains

We seek to identify the ownership chains of key enterprises in Ukraine circa early 2004, prior to the Orange Revolution that transferred power from political forces loyal to the outgoing president, Leonid Kuchma, to Viktor Yushchenko, the ultimate winner in December of the 2004 presidential election. To do so, we begin with lists of oligarch-controlled firms compiled by two Ukrainian news organizations, Delo and *Ukrains'ka Pravda*, in 2003 and 2004.<sup>7</sup> Although there is some possibility of misattribution of beneficial ownership by these organizations, most cases are uncontroversial, and these lists likely represent the “best guess” of the business and journalistic community. For the vast majority of firms in the lists, the two

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<sup>7</sup>“TOP-100. Reitingi luchshikh kompanii Ukrainy [Top 100: Ratings of the Best Ukrainian Companies],” special edition of *Invest Gazeta*, June 24, 2003 and July 26, 2004. “Khto i chym volodiie v Ukraïni [Who Owns What in Ukraine],” *Ukrains'ka Pravda*, July 17, 2003.

sources agree about the attribution of firms to particular groups.<sup>8</sup> Moreover, Delo continued to provide such lists in later years, and there are few cases where the controlling oligarch is listed as changing from 2003–4, implying both that the journalists saw no need to change their judgments and that ownership changes were rare.

For 442 firms mentioned in these two reports, we have been able to establish unique identification codes issued by the Ukrainian statistical agency Derzhkomstat. We use these codes, together with data on official ownership that we describe below, to trace ownership back to oligarchs, other individuals, and domestic, offshore, and other foreign legal entities. Table 1 summarizes the source of information for firms in our overall sample and various subsamples as described below. (Further below we discuss the much larger sample of firms summarized in the last column of Table 1.)

**Table 1: Sample composition**

	<i>Ukrainian</i>			Number of	All firms
	Delo	<i>Pravda</i>	Total	oligarch groups	in JSCReg
Original list	291	351	442	34	
With ownership data	264	295	376	29	17,599
+ sector	248	272	353	26	14,543
+ all controls	239	251	329	26	12,040

Having established a list of oligarch-controlled firms circa 2004, we identify ownership chains using data from two public databases: the Single Registry (henceforth, SReg), from Derzhkomstat, and the Joint Stock Company Registry (henceforth JSCReg), from the Stock Market Infrastructure Development Agency, or SMIDA. In principle, SReg logs all ownership transactions of registered firms in Ukraine, whereas JSCReg provides information on ownership stakes of at least 10 percent for joint stock companies (only). In practice, the quality of information in JSCReg is generally higher than that in SReg, which includes many obvious

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<sup>8</sup>For 21 firms, there are discrepancies between the two news organizations. We manually checked each of these using other news reports and official registries, based upon which we assigned group control using our best judgment.

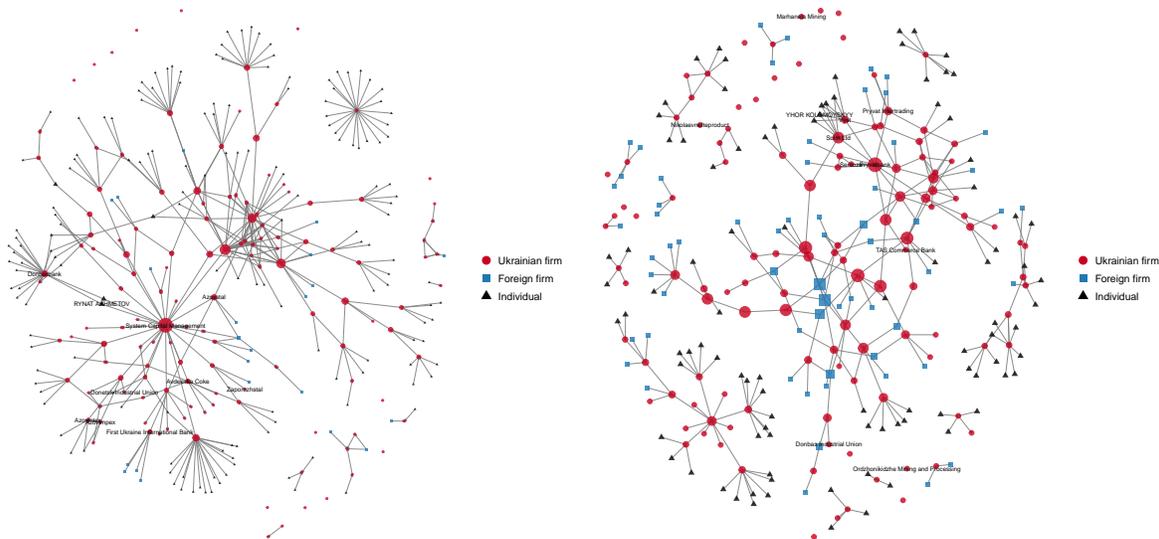
errors and omissions and with which it is typically difficult to establish the full set of a firm’s owners at any given point in time (and thus changes in the set of owners over time). That said, not all firms in our sample—and not all of their corporate owners—are joint stock companies. Moreover, JSCReg only indicates if an individual has an ownership stake (of at least 10 percent) in a joint stock company—it does not provide the owner’s identity.

Based on these considerations, we use JSCReg as our primary source of information but turn to SReg in two cases: 1) for Ukrainian firms not listed in JSCReg, and 2) for individual owners indicated but not identified in JSCReg. Using the search algorithm described in detail in the online appendix, we trace the 442 oligarch-controlled firms in our sample back to their ultimate (official) owners—either foreign firms, at which point the trail goes cold, or individuals. In this manner, we reconstruct the ownership chains of *Delo/Ukrains’ka Pravda* firms at two main points in time: in April 2004, eight months prior to the Orange Revolution, and in November 2006, two years after.<sup>9</sup> We also perform an additional search in 2002 for use in the “placebo” tests described below.

For 2004, there are in total 2479 nodes in the full network (i.e., all ownership chains for the 376 firms in the *Delo/Ukrains’ka Pravda* sample for which we have ownership data), of which 1003 are Ukrainian firms, 349 are foreign firms, 1107 are Ukrainian individuals, and 20 are foreign individuals. For 2006, there are 3275 nodes in total, of which 1158 are Ukrainian firms, 555 are foreign firms, 1530 are Ukrainian individuals, and 32 are foreign individuals. Among the individual owners, 21 (23 in 2006) are members of oligarch clans; we also observe a number of relatives and known associates of oligarchs. However, not all oligarchs on the *Delo* or *Ukrains’ka Pravda* list are identified through these ownership links. For example, neither of the two main members of the Energo group, Viktor Nusenkis and Gennady Vasiliev, turn up in the search. Similarly, we observe only two of the seven members of Kyiv-Seven

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<sup>9</sup>There are at most a few record dates available for JSCReg in any given year. April 2004 is the last record date before the onset of the 2004 presidential campaign, whereas November 2006 is approximately two years after the 2004 presidential election.



**Figure 1:** Ownership networks in 2004 for System Capital Management (Rinat Akhmetov) and Pryvat (Ihor Kolomoyskyi), respectively. Within each network, nodes are scaled by betweenness centrality, which measures the number of shortest paths in a network that go through a particular node; we further normalize by total number of nodes in the network. Firms with no connections have no identified owners that survive the elimination process described in the text.

group—Ihor and Hryhory Surkis—in the ownership chain of any firm. Figure 1 illustrates the ownership networks in 2004 of two prominent oligarch groups: System Capital Management (Rinat Akhmetov, described above) and Pryvat (Ihor Kolomoyskyi). The former is visibly more compact and includes fewer foreign firms.

For each firm in the Delo/*Ukrains'ka Pravda* sample, we characterize the ownership chain by variables representing the degree to which oligarchs obfuscate ownership of the enterprise. We consider several alternative measures. The first, most obvious, indication of obfuscation is the absence of the controlling oligarch himself (all are men) in the ownership chain (*No oligarch in chain*). (When there is more than one oligarch in the controlling group, this variable takes a value of one if we observe *none* of the members of the group.) A second,

related measure is the length of the shortest path to an oligarch, which captures the idea that longer chains serve to obscure ownership. For the regressions reported below, we define *Distance from oligarch* as  $-\frac{1}{S}$ , where  $S$  is the smallest number of steps in the chain to an oligarch; when no oligarch is present, distance takes a value of zero. As defined, higher (closer to zero) values imply more obscure ownership. A third measure of obfuscation is whether foreign corporate entities appear in the ownership chain (*Foreign in chain*), as foreign conduits for control are frequently motivated by the desire to obscure ownership. A fourth, related variable (*Offshore in chain*) focuses only on corporate owners located in an “offshore” jurisdiction (for nearly all firms with such an owner, Cyprus or the British Virgin Islands), as defined by Ukrainian law.<sup>10</sup> The latter variable is thus nested in the former.

Table 2 summarizes the incidence of these measures of obfuscation for firms in the regression sample we define below. There is substantial apparent obfuscation among the firms in our regression sample: out of 329 firms, for only 108 are we able to trace the ownership chain back to an oligarch, implying that 67 percent of firms obscure oligarch ownership in this way. Even among those firms with a visible oligarch in the ownership chain, few own directly—only four percent of the sample—with the others masking their ownership at least to some extent by using intermediaries. Moreover, 188 of the firms in the sample have among their “ultimate owners” a foreign entity, implying 57 percent potentially obfuscating along this dimension. Nearly two-thirds of those with foreign owners—some 122 firms—have owners from “offshore” countries, likely reflecting stronger efforts to obfuscate.

As we describe below, for some empirical exercises we also exploit ownership data for all firms in JSCReg as of April 1, 2004—a much larger sample, as reflected in Table 1. For the vast majority of these firms, we do not know the identity of the beneficial owner (oligarch or otherwise), and so we do not observe whether an “oligarch” is in the ownership chain. We can, however, characterize ownership chains by the presence of a foreign or offshore

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<sup>10</sup>The relevant decree (N106-p) was approved on March 11, 2000. We classify an owner as offshore if it is registered in a country or territory that has ever appeared on the list associated with this decree.

owner, as before. As reported in Table 2, approximately 13 percent of the 12,040 firms for which we have all control variables have a foreign owner of any type, versus 5 percent with an offshore owner. The lower rates of foreign and offshore ownership in the large JSCReg database implies that oligarch-controlled firms may have either higher benefits or lower costs of obfuscation.

**Table 2: Measures of hidden control, 2004**

	<u>Delo/UP</u>		<u>All firms in JSCReg</u>	
	Share	Number	Share	Number
No oligarch in chain	0.671	221		
Oligarch in chain	0.328	108		
Oligarch in chain, 1 step	0.040	13		
Oligarch in chain, $\leq 2$ steps	0.185	61		
Oligarch in chain, $\leq 3$ steps	0.292	96		
Oligarch in chain, $\leq 4$ steps	0.310	102		
Foreign in chain	0.571	188	0.131	1576
Offshore in chain	0.371	122	0.053	644

Notes: Shares based on regression sample of 329 firms (for firms identified by Delo and *Ukrain'ska Pravda*) and 12,040 firms (for all firms in JSCReg), respectively. Distance to oligarch (defined in text) for former sample: mean -0.16, standard deviation 0.26.

### 3 Political connections and other data

Our primary interest is the degree to which ownership chains reflect more or less obfuscation, depending on the political connections of the controlling oligarch. Here we describe these connections and other variables used in our analysis.

Political connections are relatively clearly delineated in Ukraine during the period just before the Orange Revolution of 2004. On one side (*Orange*, following the symbology of the Orange Revolution) are the oligarchs who supported Viktor Yushchenko in the presidential election; on the other, those who supported Viktor Yanukovich (leader of the Party of Regions, whose color was *Blue*), outgoing President Leonid Kuchma's preferred successor. We designate oligarchs not clearly aligned with either candidate as *Gray*. To assign "color" codes to the oligarch groups represented in the Delo/*Ukrain'ska Pravda* sample, we utilize information from a variety of sources: an expert survey administered at a conference of Ukraine

specialists; an interview with Serhiy Leshchenko, Ukraine’s premier investigative journalist and from 2014 to 2019 a member of parliament; further interviews with various policymakers and specialists in Kyiv; the *Ukraïns’ka Pravda* report discussed above; a review of numerous other news reports; and our own expert knowledge. There was little disagreement among these diverse sources. The resulting classification of oligarchs according to their political connections before the Orange Revolution is as follows:

- **Orange:** Aval, Brinkford (David Zhvania), Finansy i Kredyt (Kostyantyn Zhevago), Orlan, Pryvat (Ihor Kolomoyskyy), Oleksandr Tretiakov, UkrPromInvest (Petro Poroshenko)
- **Blue:** Andriy Derkach, Energo (Victor Nusenkis), Anatoliy and Igor Franchuk, Interpipe (Viktor Pinchuk), Vasyl Khmelnytskyi, Andriy and Serhiy Kliuev, Kyiv Seven, “Old Donetsk,” Radon, System Capital Management (Rinat Akhmetov), Dmytro Tabachnyk, TAS (Serhiy Tihipko), Ukrinterproduct (Oleksandr Leshchinskyi)
- **Gray:** Basis, Oleksandr Feldman, Intercontact, ISD (Serhiy Taruta), UkrSotsBank (Valeriy Khoroshkovskyy), UkrSybBank (Oleksandr Yaroslavsky)

It is notable that only two firms in our sample are co-owned by oligarch groups of different “color”, implying that the color groups are distinct not only politically, but in terms of ownership as well; we code these two firms as Gray.<sup>11</sup> Table 3 shows that firms controlled by Blue oligarchs account for 50 percent of the sample, whereas those controlled by Orange and Gray oligarchs constitute 30 and 20 percent, respectively.

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<sup>11</sup>Joint control by multiple owners is uncommon in Ukraine, as in most developing countries (La Porta, Lopez-de Silanes and Shleifer, 1999), so typically there is a single controlling owner of each firm. Of course, an oligarch may set up multiple vehicles for ownership as part of a strategy of obfuscation.

**Table 3: Political connections and control variables**

<b>Panel A: Indicators</b>				
	<b>Delo/<i>UP</i></b>		<b>All firms in JSCReg</b>	
	<b>Share</b>	<b>Number</b>	<b>Share</b>	<b>Number</b>
Blue	0.502	165		
Orange	0.295	97		
Gray	0.204	67		
Privatized	0.620	204	0.409	4,933

<b>Panel B: Continuous variables</b>				
	<b>Delo/<i>UP</i></b>		<b>All firms in JSCReg</b>	
	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
Employment	2180	5350	222	1583
TFP	0.36	1.41	-0.12	1.13
Vote for Yushchenko			0.55	0.31

Notes: Shares and summary statistics based on regression sample of 329 firms (for firms identified by Delo and *Ukrainska Pravda*) and 12,040 firms (for all firms in JSCReg), respectively.

In estimating the effect of political connections on the behavior of oligarch-controlled firms, we condition on observable firm-level characteristics. In principle, the benefits of obfuscation may be increasing in the value of the assets, as measured by the size (*Log employment*) and *Total factor productivity (TFP)* of the firm. At the same time, size may be related to the cost of obfuscation, as intermediaries extract larger compensation to obscure the beneficial ownership of a firm. We consider both variables.

We draw firm-level data from the Ukrainian statistical agency Derzhkomstat, which supplies annual enterprise performance data, balance sheets, and financial results for firms in all sectors. Employment, output (annual net sales after indirect taxes), and material cost come from the enterprise performance statement. For firm-year observations missing output data in the enterprise performance statement, we use net sales after indirect taxes from the financial results statement. Capital stock comes from the balance sheet and is constructed as the mean of the start-of-year and end-of-year values of tangible assets. We deflate output, capital and material cost with a GDP deflator. All variables are measured as of 2004 unless missing, in which case we use the last available non-missing value (but not before 2002).

Employment is measured as the average number of employees in a given year. Total factor productivity is estimated with the following equation on the sample of all firms in the economic data (i.e., not only the oligarch-controlled firms in our sample) from 2002 to 2006:

$$Y_{ijt} = f_j(K_{ijt}, L_{ijt}, M_{ijt}) + \psi_{jt} + u_{ijt}, \quad (3)$$

where  $i$  indexes firms,  $j$  indexes ten sectors,<sup>12</sup> and  $t$  indexes years. The variables  $Y$ ,  $K$ ,  $L$ , and  $M$  denote sales, capital, employment, and material cost, respectively, while  $\psi_{jt}$  represents sector-year fixed effects. We assume an unrestricted Cobb-Douglas production function  $f_j$ , in which we allow all coefficients to vary by sector. TFP in 2004 is measured as the 2004 residual from this equation.

Table 3 provides summary statistics for these variables. The average number of employees is 2180, implying that the oligarch-controlled firms in our data are very large, accounting for 10.2 percent of private-sector employment in 2004. Oligarch-controlled firms are especially concentrated in manufacturing (48 percent), wholesale and retail (13 percent), and mining and quarrying (7 percent).

Finally, a special feature of transition economies is that vulnerability to predation may be related to the manner in which assets were acquired (Frye, 2006; Denisova et al., 2009; Frye, 2017). In the Ukrainian context in particular, asset acquisition through a non-transparent privatization process might expose the new owners to charges of corruption or favoritism, which could be used as a rationale by state actors or rival oligarchs to justify raids. Alternatively, acquisition through privatization may be more transparent than setting up shell companies and transferring assets to *de novo* firms, so that privatized firms involve less obfuscation than others. Although there is little information available on the details of the privatization process at the firm level, our data permit us to distinguish privatized from *de*

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<sup>12</sup>Agriculture, forestry, and fishing; mining and quarrying; manufacturing; construction and utilities; wholesale and retail; accommodation and food service; transport and communication; financial and insurance services; real estate; and education, health, and sport.

*novo* firms. (There are no fully state-owned firms in our sample.) Following Brown et al. (2018), we use data on state ownership from the State Property Fund Registry (SPFR) and property form codes from the performance statement, classifying firms as *Privatized* if they were ever state-owned according to either of these sources.

## 4 Empirical strategy

Our baseline estimating equation is as follows:

$$O_i = \beta_1 ORANGE_i + \beta_2 GRAY_i + \beta_3 SIZE_i + \beta_4 TFP_i + \beta_5 PRIVATIZED_i + SECTOR_i\gamma + u_i. \quad (4)$$

In this specification,  $i$  indexes firms. The variable  $O_i$  is a firm-level measure of obfuscation: no oligarch in chain, distance to oligarch, foreign in chain, and offshore in chain. The effects of  $ORANGE_i$  and  $GRAY_i$  are estimated relative to the excluded category  $BLUE_i$ . The variable  $SIZE_i$  is measured as the log of employment, and  $TFP_i$  and  $PRIVATIZED_i$  are defined as above, all measured in 2004. As the benefits and costs of obfuscation may vary across industries, we include a full set of sector fixed effects (which absorb the constant), as defined above.<sup>13</sup>

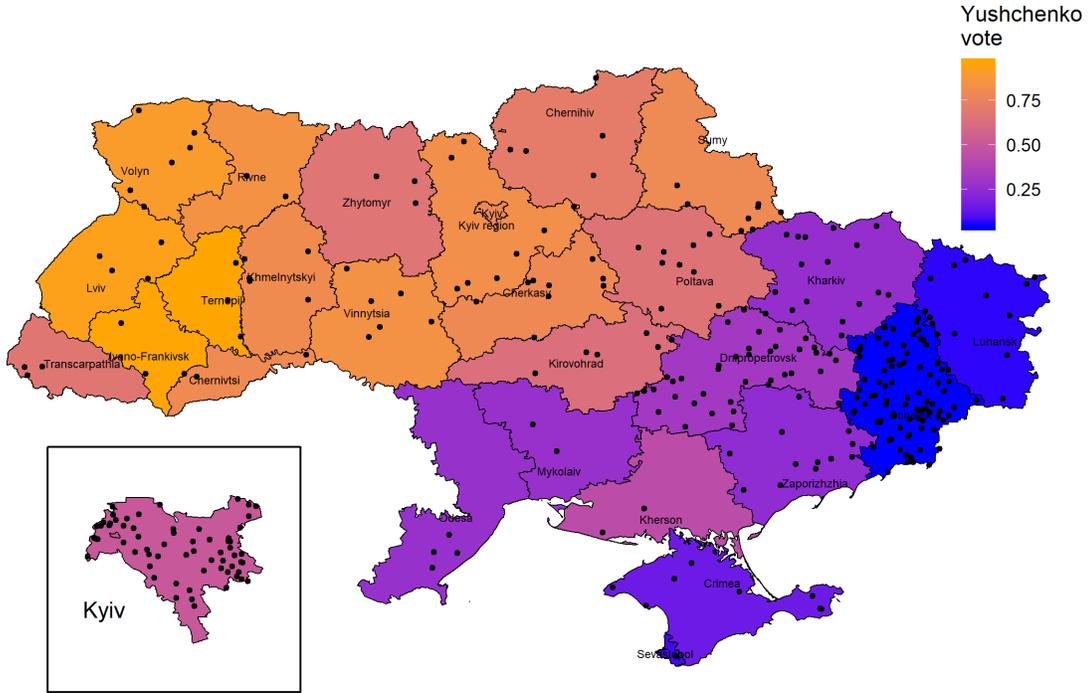
For reasons we discuss below, we also consider the alternative specification

$$O_i = \beta_1 COLOR_i + \beta_2 SIZE_i + \beta_3 TFP_i + \beta_4 PRIVATIZED_i + SECTOR_i\gamma + u_i. \quad (5)$$

The variable  $COLOR_i$  is a linear measure of the strength of connections to the incumbent regime in 2004, where  $COLOR_i$  equals 0 if the firm’s controlling oligarch is Blue, 1 if Gray, and 2 if Orange.

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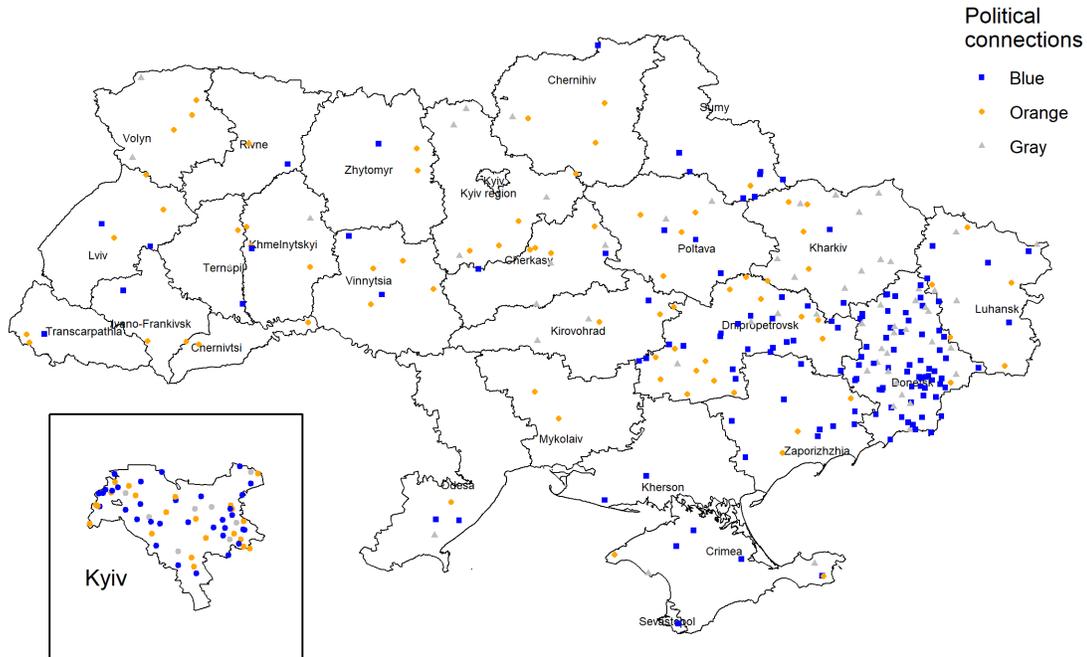
<sup>13</sup>With respect to the education, health, and sport sector, Demsetz and Lehn (1985) discuss the “amenity potential” of (publicly) owning certain types of firms, citing media and sports clubs as prominent examples. This would represent the opposite of the phenomenon we study in this paper: flaunting rather than obscuring ownership.



**Figure 2:** Vote for Yushchenko in the “do-over” second round of the 2004 presidential election. Each point represents an oligarch-controlled firm. Points are jittered within provinces for legibility.

Estimation of Equations 4 and 5 is complicated by two related issues. First, notwithstanding our substantial investment in understanding Ukraine’s political economy, political connections may be measured with error. Some oligarchs, for example, may “mix” across political parties, which our classification may not fully capture. Second, as alternative means of avoiding predation, obfuscation and political connections are jointly determined, such that connections may be endogenous to obfuscation.

We follow two strategies to address these concerns. First, we estimate Equation 5 by two-stage least squares, instrumenting  $COLOR_i$  on the province-level *Vote for Yushchenko* in the “do-over” second round of the 2004 presidential election. (With only one instrumental variable, we cannot include  $ORANGE_i$  and  $GRAY_i$  separately in the equation.) As in Earle and Gehlbach (2015) and Makarin and Korovkin (2018), this strategy exploits the stark political-economic geography of contemporary Ukraine, whereby business groups and politi-



**Figure 3:** Political connections of oligarch-controlled firms. Points are jittered within provinces for legibility.

cal parties are concentrated in particular regions (Hale, 2005). Figures 2 and 3 illustrate this variation. Blue firms are overwhelmingly located in the east of the country, where Viktor Yanukovich won enormous majorities in the 2004 presidential election. Orange and Gray firms, in contrast, are more uniformly distributed across provinces.

To be a valid instrument, the political alignment of a province must affect obfuscation only through the political connections of a firm’s owner. In principle, this assumption would be violated if firms in provinces supported by Yushchenko were systematically more or less likely to obscure ownership because of the nature of their business activities. (Western and central Ukraine are much less heavily populated by heavy industry than the east of the country.) We control for such tendencies through the inclusion of sector fixed effects in all regressions. A separate concern is that provinces that supported Yushchenko might have different local political economies than those that supported Yanukovich, which could induce differences in obfuscation independent of the political connections of local enterprises.

Although we are aware of no data that would allow us to test this proposition directly,<sup>14</sup> in practice any inherent regional differences in business environment are likely muted by an important institutional feature: provincial governors—the most important local political actor in any region—are not elected but instead selected directly by the incumbent president.

Second, we exploit the shock to political connections produced by the Orange Revolution. This is our preferred specification, though as we discuss below it comes with some limitations. Yushchenko’s ultimate victory in the 2004 presidential election was unanticipated, giving oligarchs little time to adjust to the new political environment. We assume that frictions in changing connections from one side to another mean that the connections formed prior to the Orange Revolution are costly to alter and therefore persist for some time after 2004. Consider, then, the following equation to be estimated on a two-period panel:

$$\begin{aligned}
O_{it} = & \beta_1 ORANGE_i + \beta_{11} ORANGE_i \cdot t + \beta_2 GRAY_i + \beta_{21} GRAY_i \cdot t \\
& + \beta_3 SIZE_i + \beta_{31} SIZE_i \cdot t + \beta_4 TFP_i + \beta_{41} TFP_i \cdot t \\
& + \beta_5 PRIVATIZED_i + \beta_{51} PRIVATIZED_i \cdot t \\
& + SECTOR_i \gamma + SECTOR_i \gamma_1 \cdot t + \alpha_i + u_{it},
\end{aligned}$$

where  $t \in \{0, 1\}$  indexes periods and all variables are measured at  $t = 0$ . In the regression results we report below,  $t = 0$  corresponds to 2004 and  $t = 1$  to 2006. Note that this specification permits coefficients to vary in 2006 versus 2004 not only for the color variables but also for every variable on the right-hand side, rather than assuming that some regressors have constant effects. Essentially, we have stacked two separate equations for 2004 and 2006 into a single regression. The fixed effect  $\alpha_i$  captures time-invariant firm (and thus provincial)

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<sup>14</sup>The widely employed Business Environment and Enterprise Performance Survey (BEEPS) does not include region identifiers for waves before 2004.

characteristics. Then differencing the equation for  $t = 0$  from that for  $t = 1$  gives

$$\Delta O_i = \beta_{11} ORANGE_i + \beta_{21} GRAY_i + \beta_{31} SIZE_i + \beta_{41} TFP_i + \beta_{51} PRIVATIZED_i + SECTOR_i \gamma_1 + \epsilon_i. \quad (6)$$

where  $\Delta O_i$  is the change in obfuscation from  $t = 0$  to  $t = 1$  and  $\epsilon_i \equiv u_{i1} - u_{i0}$ . Similarly,

$$\Delta O_i = \beta_{11} COLOR_i + \beta_{21} SIZE_i + \beta_{31} TFP_i + \beta_{41} PRIVATIZED_i + SECTOR_i \gamma_1 + \epsilon_i. \quad (7)$$

Analogously to the cross-sectional regressions above, we additionally estimate Equation 7 by two-stage least squares, instrumenting  $COLOR_i$  on vote for Yushchenko in 2004.

One complication in estimating Equations 6 and 7, as discussed above, is that it is difficult to identify changes in ownership with SReg. We address this concern in two ways. First, we restrict attention to our latter two measures of obfuscation: (change in) foreign or offshore in chain. We thus ignore the presence of oligarchs in the ownership chain, which can be identified only with SReg. Second, as a robustness check, we characterize ownership chains using data only from JSCReg. The latter approach comes with a tradeoff: although changes in obfuscation may be measured with greater precision using JSCReg, the resulting sample is approximately 20 percent smaller.

As discussed above, we also observe presence of a foreign or offshore owner in the ownership chain of firms in the much larger sample of all joint stock companies. As we do not know the beneficial owner for the vast majority of these firms, we cannot code political connections directly. A reasonable assumption, however, is that firms located in provinces electorally supportive of Victor Yushchenko have owners who are more likely to be connected to Yushchenko, which we show below holds strongly for oligarch-controlled firms in the narrower *Delo/Ukraiïns'ka Pravda* sample. We therefore estimate the “reduced form” equations

$$O_i = \beta_1 YUSHCHENKO_i + \beta_2 SIZE_i + \beta_3 TFP_i + \beta_4 PRIVATIZED_i + INDUSTRY_i \gamma + u_i. \quad (8)$$

and

$$\Delta O_i = \beta_{11} YUSHCHENKO_i + \beta_{21} SIZE_i + \beta_{31} TFP_i + \beta_{41} PRIVATIZED_i + INDUSTRY_i \gamma_1 + \epsilon_i, \quad (9)$$

where  $YUSHCHENKO_i$  is vote for Yushchenko in 2004. The differenced specification in Equation 9 captures firm fixed effects as in Equations 6 and 7. We include fixed effects at the two-digit industry level (less coarse than the sector partition defined above, which is possible given the larger sample); 57 industries are represented in the sample.

In what follows, we report standard errors corrected to account for clustering of error terms at the level of treatment assignment: oligarch (political connections) for Equations 4–7, province (vote for Yushchenko) for Equations 8 and 9.

## 5 Results

### 5.1 2004 Cross section

Table 4 reports results from cross-sectional regressions for our first two measures of obfuscation: the absence of oligarch in the (observed) ownership chain, and the distance to oligarch in the ownership chain (where absence takes the highest possible value). The estimated coefficient on Orange is positive and statistically significant for both outcomes. The point estimate in the first regression (Column 1) implies that oligarchs politically affiliated with Viktor Yushchenko and his allies are 28.2 percentage points more likely to be absent from the observed chain, relative to oligarchs associated with the incumbent regime and Viktor Yanukovich—approximately four tenths the unconditional mean of 67.1 percent. Similarly, Orange-affiliated oligarchs are further removed in the ownership chain than are Blue-affiliated oligarchs (Column 5). The latter result is driven substantially by the former: the point estimate for Orange in Column 5 is about half as large when the sample is limited to firms with an oligarch somewhere in the chain. For both measures of obfuscation, the coefficient on Gray is also positive, but much smaller and statistically indistinguishable from zero.

Table 4: Oligarch in ownership chain

	(1)	(2)		(3)		(4)		(5)		(6)		(7)		(8)
	OLS	No oligarch in chain		IV		Reduced		OLS		OLS		IV		Reduced
Orange	0.282*** (0.092)							0.134** (0.054)						
Gray	0.059 (0.158)							0.061 (0.069)						
Color		0.137** (0.048)	0.342** (0.166)							0.067** (0.028)	0.126* (0.067)			
Vote for Yushchenko						0.313*** (0.106)								0.116** (0.054)
Employment	-0.006 (0.016)	-0.005 (0.016)	-0.005 (0.016)	0.007 (0.017)	-0.004 (0.007)	-0.004 (0.007)	-0.004 (0.007)	-0.004 (0.007)	-0.004 (0.007)	-0.004 (0.007)	-0.004 (0.007)	0.005 (0.009)	0.005 (0.009)	0.000 (0.007)
TFP	0.018 (0.019)	0.022 (0.016)	0.028 (0.019)	0.017 (0.015)	0.003 (0.011)	0.003 (0.010)	0.003 (0.010)	0.003 (0.011)	0.003 (0.010)	0.003 (0.010)	0.003 (0.010)	0.005 (0.012)	0.005 (0.009)	0.001 (0.009)
Privatized	0.228** (0.090)	0.235** (0.086)	0.235** (0.100)	0.247*** (0.077)	0.116** (0.043)	0.116** (0.041)	0.116** (0.043)	0.116** (0.043)	0.116** (0.043)	0.116** (0.041)	0.116** (0.043)	0.116** (0.043)	0.121*** (0.039)	0.121*** (0.039)
Sector FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	329	329	329	329	329	329	329	329	329	329	329	329	329	329

Notes: Dependent variable is absence of oligarch in ownership chain (columns 1-4) and -1/(steps to oligarch) (columns 5-8). In Columns 1 and 5, the excluded political affiliation is Blue. In Columns 3 and 7, Color (0 = Blue, 1 = Gray, 2 = Orange) is instrumented with province-level vote for Yushchenko in do-over second round of 2004 presidential election. Columns 4 and 8 are corresponding reduced-form regressions. First-stage  $F$ -statistic = 6.89; complete first-stage results reported in appendix. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level. Significance levels: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

We find similar results for Color, our continuous measure of political connections, both in OLS (Columns 2 and 6) and instrumental-variables (Columns 3 and 7) regressions. For the OLS specification, moving from Blue (Color = 0) to Orange (Color = 2) produces an estimated effect on obfuscation similar to that implied by the categorical specifications in Columns 1 and 5. With respect to the instrumental-variables regressions, the point estimates for Color are 2–3 times larger than the corresponding OLS estimates, which may reflect measurement error in the underlying classifications of political connections. The first-stage  $F$ -statistic of 6.89 is relatively low (the corresponding  $F$ -statistic when we do not “cluster by oligarch” is 45.8), though as Angrist and Pischke (2008, p. 209) note, just-identified two-stage least squares (as here, with a single endogenous regressor and single instrument) is approximately unbiased. Further, as Chernozhukov and Hansen (2008) show, even when instruments are weak, the null hypothesis of no effect of the endogenous variable can be rejected if the instrument is significantly correlated with the dependent variable in the corresponding reduced-form regression, which is true for both outcomes reported in this table. The estimate from Column 4 implies that moving from vote for Yushchenko of 4.2 percent (Donetsk) to 96 percent (Ternopil)—the full range of the variable— increases the probability that no oligarch is observed in the ownership chain by approximately 29 percentage points.

Among the three control variables, the estimated effect of Privatized is uniformly positive and statistically significant, in line with the idea that a non-transparent privatization exposes the firm to predation, to which the controlling oligarch responds by obfuscating ownership. Neither employment size nor TFP is significantly associated with presence or position of oligarch in the ownership chain.

Table 5: Foreign/offshore owners

	(1)	(2)		(3)	(4)	(5)	(6)		(7)	(8)
	OLS	Foreign in chain		IV	Reduced	OLS	Offshore in chain		IV	Reduced
		OLS	OLS			OLS	OLS	OLS		
Orange	0.081 (0.135)					0.134 (0.117)				
Gray	-0.177 (0.130)					-0.204** (0.097)				
Color		0.029 (0.069)		0.254 (0.162)			0.053 (0.062)		0.197 (0.161)	
Vote for Yushchenko					0.232* (0.130)					0.180 (0.140)
Employment	0.036* (0.019)	0.036* (0.019)	0.037 (0.024)	0.037 (0.024)	0.046** (0.019)	0.006 (0.017)	0.007 (0.019)	0.007 (0.021)	0.007 (0.020)	0.014 (0.013)
TFP	0.021 (0.017)	0.031* (0.016)	0.038* (0.021)	0.038* (0.021)	0.029* (0.017)	0.004 (0.015)	0.016 (0.012)	0.020 (0.015)	0.020 (0.015)	0.014 (0.013)
Privatized	-0.015 (0.076)	0.003 (0.078)	0.003 (0.090)	0.003 (0.090)	0.012 (0.082)	-0.082 (0.087)	-0.059 (0.086)	-0.060 (0.095)	-0.060 (0.089)	-0.053 (0.089)
Sector FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	329	329	329	329	329	329	329	329	329	329

Notes: Dependent variable is presence of foreign owner (columns 1-4) and offshore owner (columns 5-8) in ownership chain. In Columns 1 and 5, the excluded political affiliation is Blue. In Columns 3 and 7, Color (0 = Blue, 1 = Gray, 2 = Orange) is instrumented with province-level vote for Yushchenko in do-over second round of 2004 presidential election. Columns 4 and 8 are corresponding reduced-form regressions. First-stage  $F$ -statistic = 6.89; complete first-stage results reported in appendix. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level. Significance levels: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 5 presents cross-sectional results for our second set of measures of obfuscated ownership: presence of a foreign or offshore entity in the ownership chain. The estimated coefficient on Orange and Color is consistently positive, but nowhere precisely estimated. That said, the statistically significant effect of vote for Yushchenko in the reduced-form regression in Column 4 implies that we can reject the null of no effect of Color on foreign ownership (see above). Somewhat surprisingly, unaffiliated (or ambiguously affiliated) Gray firms are least likely to have foreign or offshore owners—significantly so in the latter case.

In contrast to the results reported in Table 4, we find no evidence that privatized firms are more (or less) likely to obfuscate ownership through the use of foreign or offshore owners. Large firms, however, are significantly more likely to have foreign owners—but not those in offshore jurisdictions—in the ownership chain.

## 5.2 Panel

We now turn to our preferred empirical strategy, which exploits time variation from the shock to political connections that accompanied the Orange Revolution of 2004. As discussed above, data constraints imply that we are only able to estimate the effect of political connections on changes in presence of a foreign or offshore entity in the ownership chain—not changes in presence or position of oligarch in the chain. For similar reasons, we examine ownership changes both using our baseline data and using ownership information from JSCReg only, with the latter results reported in the online appendix.

Our hypothesis is that incentives for obfuscating ownership switched for Orange and Blue firms after the Orange Revolution, given that oligarchs connected to Victor Yushchenko were better protected after he assumed the presidency, whereas the value of connections to Victor Yanukovych declined after the political turnover. Table 6 provides preliminary evidence of such changes. Twenty firms controlled by Blue oligarchs added foreign owners between 2004 and 2006, according to our baseline data; in contrast, only six Orange and seven Gray firms did so. The change is even more striking when looking at foreign owners located in offshore jurisdictions. Thirty-six Blue firms added such owners according to our baseline

data (versus three Orange and 18 Gray firms)—larger numbers than added foreign owners in general, implying that the oligarchs who controlled some of these firms added offshore owners when they already had foreign owners in non-offshore jurisdictions. (Table A3 in the online appendix provides detailed information on the number of firms with foreign and offshore owners, by oligarch group.)

**Table 6: Number of firms with foreign and offshore owners**

	2004	2006
Foreign	188	221
Blue	99	119
Orange	63	69
Gray	26	33
Offshore	122	179
Blue	62	98
Orange	49	52
Gray	11	29

Table 7 unpacks these changes, showing transition rates (gross flows) across ownership types from 2004 to 2006 by firm color/affiliation. The hazard rate for a Blue firm to move from domestic to foreign (40.9 percent) is much higher than for an Orange firm (26.5 percent), and the movement from non-offshore foreign ownership to offshore is particularly striking: more than half (51.4 percent) of Blue firms with non-offshore ownership become offshore in this short two-year period. On the other hand, one might have expected Orange firms to engage in less obfuscation in 2006 compared to 2004, but we find that few firms of any political affiliation with foreign ownership in 2004 change to completely domestic ownership by 2006: only 4.8 percent of Orange firms switch from foreign to domestic, for example. This result is consistent with the costs of obfuscation being largely fixed rather than variable, and sunk, so that they cannot be recovered by reversing course. Even if politically well-connected in 2006, Orange oligarchs may have been influenced by their recent experiences in opposition and perceived that the regime could shift again (as indeed it did).

**Table 7: Ownership transitions, 2004 to 2006**

	DO, NOFF				
	DO → FO	→ OFF	DO → OFF	NOFF → OFF	FO → DO
All	0.326	0.343	0.277	0.485	0.069
Blue	0.409	0.398	0.333	0.514	0.071
Orange	0.265	0.229	0.206	0.286	0.048
Gray	0.244	0.339	0.244	0.600	0.115

Notes: Proportion of firms transitioning to/from: domestic ownership only (DO), foreign ownership (FO), foreign but only non-offshore ownership (NOFF), and foreign offshore ownership (OFF).

Table 8 presents more systematic evidence of these trends, based on the differenced Equations 6 and 7. The estimated coefficient on the Orange dummy is consistently negative, and it is significant when change in presence of offshore owners is the dependent variable. The estimated effect of the Color variable is similarly negative in all specifications, though of inconsistent magnitude and not always precisely estimated. The corresponding reduced-form regressions imply that we can reject the null of no relationship between the Color variable and change in presence of foreign but not offshore owners.

**Table 8: Change in foreign/offshore owners, 2004 to 2006**

	(1)	(2)		(3)	(4)	(5)	(6)		(7)	(8)
	OLS	OLS	Yes	IV	Reduced	OLS	OLS	Yes	IV	Reduced
Orange	-0.076 (0.080)					-0.202*** (0.051)				
Gray	-0.019 (0.088)					0.059 (0.079)				
Color		-0.037 (0.042)		-0.160* (0.093)			-0.092*** (0.026)		-0.125 (0.116)	
Vote for Yushchenko					-0.145** (0.069)					-0.113 (0.101)
Employment	0.006 (0.009)	0.005 (0.009)	Yes	0.005 (0.012)	-0.000 (0.009)	0.021 (0.014)	0.021 (0.014)	Yes	0.021 (0.014)	0.017 (0.014)
TFP	-0.011 (0.010)	-0.012 (0.010)		-0.016 (0.010)	-0.010 (0.009)	0.004 (0.010)	-0.003 (0.008)		-0.004 (0.009)	-0.000 (0.008)
Privatized	0.028 (0.050)	0.027 (0.047)	Yes	0.028 (0.054)	0.021 (0.050)	0.091 (0.062)	0.078 (0.056)	Yes	0.078 (0.056)	0.073 (0.055)
Sector FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	327	327	327	327	327	327	327	327	327	327

Notes: Dependent variable is change in presence of foreign owners (columns 1–4) and offshore owners (columns 5–8) in ownership chain, 2004 to 2006. In Columns 1 and 5, the excluded political affiliation is Blue. In Columns 3 and 7, Color (0 = Blue, 1 = Gray, 2 = Orange) is instrumented with province-level vote for Yushchenko in do-over second round of 2004 presidential election. Columns 4 and 8 are corresponding reduced-form regressions. First-stage  $F$ -statistic = 6.66; complete first-stage results reported in appendix. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level. Significance levels: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Notably, we find no evidence that any of our covariates has an effect on changing ownership patterns after the Orange Revolution. It was the value of connections to Yushchenko and Yanukovich, respectively, not the effects of size, productivity, or privatization status, that changed when the presidency turned over in January 2005.

In the online appendix (Table A5), we report robustness to using ownership information from JSCReg only. The results are broadly similar to those in Table 8, but only the offshore results are significant (where they were before). Appendix Tables A6 and A7 provide an additional check on our results: “placebo” regressions analogous to Equations 6 and 7, but with change in obfuscation from 2002 to 2004—that is, the two years *before* the Orange Revolution. Across all specifications, the estimated effects of Orange and Color are statistically insignificant, with point estimates that are often negative (i.e., of the opposite sign to those reported in Tables 8 and A5). We find no evidence that the trends reported above predated the Orange Revolution.

Overall, our results suggest that firms controlled by oligarchs less connected to the incumbent regime were more likely to obfuscate ownership through a variety of methods prior to 2004, with the relationship strongest for oligarch in chain and distance to oligarch. We also find considerable evidence that the greater tendency of Orange oligarchs to obfuscate before the Orange Revolution declined or even reversed following the Orange Revolution, when the connections of Blue oligarchs lost much of their value.

### **5.3 Alternative explanations**

One can construct various potential alternative explanations for the patterns documented above. If Blue oligarchs had names that were easier to match in the Single Registry (e.g., because of transliteration errors between Ukrainian and Russian or a greater incidence of common names), for example, that might explain the disproportionate presence of such owners in the ownership chain. In fact, as we discuss in the online appendix, we established numerous checks to ensure that any oligarch in the Single Registry is identified as such (manually checking, for example, against numerous possible [mis]spellings of the same name),

and that no non-oligarchs were misidentified as oligarchs (e.g., by examining postal addresses and patterns of cross-ownership by oligarchs of the same group).

With respect to foreign and offshore ownership, in principle less connected owners may be more in need of the legitimate legal services available in offshore jurisdictions—Cyprus especially. Such a mechanism would be broadly consistent with our theoretical framework, in that oligarchs without connections are at greater risk of opportunistic behavior (e.g., breach of contract) that could be mitigated through offshore ownership. That said, the totality of our results, in which presence of an oligarch in the ownership chain is also correlated with the political connections of the firm’s beneficial owner, is perhaps better explained by the fear of predation.

Similarly, less connected oligarchs might form alliances with foreign investors as a means of protecting against expropriation (e.g., Markus, 2015). Although we cannot rule out this possibility completely, it seems unlikely that powerful foreign investors would be registered primarily in offshore jurisdictions such as Cyprus, which is where much of the movement in ownership following the Orange Revolution is concentrated. Our results are better explained by a strategy of obfuscating ownership to avoid predation.

#### **5.4 All joint stock companies**

Our final exercise exploits the full sample of firms in JSCReg. We infer political connections (not observed directly for the vast majority of these firms) from the province-level vote for Yushchenko in 2004, which as shown above is a strong predictor of connections for the Delo/*Ukrain’s’ka Pravda* sample of oligarch-controlled firms.

Table 9 presents results for estimation of Equation 8, without and with controls for employment, TFP, and privatized status. Firms presumed to be “Orange”—those in provinces more supportive of Viktor Yushchenko—are more likely to have foreign and offshore owners in the ownership chain, though the relationship is not precisely estimated. The coefficient magnitudes are not small relative to the unconditional means of the dependent variables: 0.131 for foreign and 0.053 for offshore, respectively. That said, comparison with the reduced-form

estimates reported above shows that the point estimates for Yushchenko vote are approximately half those for the *Delo/Ukrains'ka Pravda* sample, relative to the unconditional mean for each sample, which may reflect the diminished presence of firms with a stake in national politics—many of the enterprises in the larger sample are regional or local firms more dependent on mayors and other local officeholders. (This tendency may be partially captured by the employment control, the estimated effect of which is positive.)

**Table 9: Foreign/offshore owners, all firms in JSCReg**

	(1)	(2)	(3)	(4)
	Foreign in chain		Offshore in chain	
Vote for Yushchenko	0.023 (0.034)	0.025 (0.023)	0.014 (0.016)	0.015 (0.013)
Employment		0.039*** (0.003)		0.019*** (0.002)
TFP		0.027*** (0.004)		0.007*** (0.002)
Privatized		0.013 (0.010)		0.010 (0.008)
Industry FEs	Yes	Yes	Yes	Yes
Observations	14,543	12,040	14,543	12,040

Notes: Dependent variable is presence of foreign owner (columns 1–2) and offshore owner (columns 3–4) in ownership chain. Political connections are proxied by province-level vote for Yushchenko in do-over second round of 2004 presidential election. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at provincial level. Significance levels: \*  $p < 0.10$ , \*  $p < 0.05$ , \*  $p < 0.01$ .

Table 10, in turns, regresses change in presence of foreign or offshore owner from 2004 to 2006 on the same variables as in Table 9. The negative point estimate on vote for Yushchenko in Columns 1 and 2 implies that firms in provinces more supportive of Viktor Yanukovich (the ultimate loser in 2004) are more likely to add foreign firms to the ownership chain after the Orange Revolution. We observe similar patterns for offshore firms, though the estimated effect of vote for Yushchenko is not statistically significant. Overall, the results from the much larger sample of all firms in JSCReg are broadly consistent with those from the sample of *Delo/Ukrains'ka Pravda* firms for which we can observe political connections directly:

stronger and more precisely estimated in the panel than the cross-sectional setting.

**Table 10: Change in foreign/offshore owners, 2004 to 2006, all firms in JSCReg**

	(1)	(2)	(3)	(4)
	Foreign in chain		Offshore in chain	
Vote for Yushchenko	-0.022**	-0.018**	-0.016	-0.011
	(0.008)	(0.008)	(0.010)	(0.010)
Employment		0.008***		0.009***
		(0.002)		(0.002)
TFP		0.002		0.004
		(0.003)		(0.003)
Privatized		-0.005		-0.002
		(0.006)		(0.006)
Industry FEs	Yes	Yes	Yes	Yes
Observations	12,708	11,014	12,708	11,014

Notes: Dependent variable is change in presence of foreign owner (columns 1–2) and offshore owner (columns 3–4) in ownership chain, 2004 to 2006. Political connections are proxied by province-level vote for Yushchenko in do-over second round of 2004 presidential election. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at provincial level. Significance levels: \*  $p < 0.10$ , \*  $p < 0.05$ , \*  $p < 0.01$ .

## 6 Conclusions and discussion

This paper sheds light on a common but understudied phenomenon: the obfuscation of ownership through opaque ownership chains and foreign entities. We argue that, in an environment of generally weak protection of property rights, obfuscation can discourage predation by competitors and the state. Both the costs and benefits of this strategy may depend on the controlling owner’s political connections.

Our empirical analysis focuses on Ukraine before and after the 2004 Orange Revolution, which resulted in the first real political turnover since the fall of the Soviet Union in 1991. Property rights were weak and a small number of oligarchs with varying political connections controlled hundreds of highly valuable firms. Combining information from investigative journalists on such control with rich data on legal ownership ties, we explore the relationship between political connections—which can also be used to avoid predation—and various

measures of obfuscation.

We find that oligarchs who were in opposition to the ruling group before the Orange Revolution were more likely to obfuscate ownership through a variety of mechanisms: by relying on related individuals or entities, such that the oligarch is either absent from the ownership chain entirely or distant from the firm he controls, and perhaps through the use of foreign owners behind which ownership can be obscured. At the same time, we observe that oligarchs who were close to the regime in 2004 reversed course after the Orange Revolution, turning to foreign and particularly offshore entities to protect their suddenly vulnerable assets. Similar patterns appear among a much larger sample of joint stock companies, for which we infer political connections from the electoral history of the province in which the firm is located.

From the perspective of the simple model we present in this paper, our results clearly demonstrate the substitutability of political connections and obfuscation in reducing the risk of predation. Seemingly less important is the alternative mechanism, whereby connected owners might have fewer worries about legal exposure or access to finance, which if predominant would imply a positive correlation between political connections and obfuscation—opposite to what we find. Whether the relative importance of these two sets of factors is similar in other empirical contexts is an important question for future research—one that, as we show formally, can be explored by examining directly the relationship between political connections and obfuscation.

Our research setting—Ukraine just before and after the Orange Revolution—is characterized by insecurity of property rights and unanticipated political turnover. An interesting question is whether our findings would generalize to other environments. Would, for example, the ownership chains of firms controlled by the Koch brothers, Jeff Bezos, or Michael Bloomberg change depending on who held the U.S. presidency? In an environment of strong institutions, political connections may be relatively unimportant for securing property rights and gaining other advantages (Fisman et al., 2012). The value of strong ties to a particular

faction is also attenuated when political turnover is frequent, in which case firms may diversify connections among competing political groups. The lack of genuine turnover in Ukraine since the fall of the Soviet Union may have created a situation whereby Blue oligarchs were under-diversified, allowing us to observe latent relationships that would be harder to perceive in other contexts.

Also left unanswered in our study is the relationship between obfuscation and other strategies emphasized in existing work: the formation of stakeholder alliances, for example, or the adoption of popular causes to increase the legitimacy of control. Future work can explore these and other relationships, more fully accounting for obfuscation as an active strategy to avoid predation when generalized protection of property rights is weak.

Finally, our work is relevant to a somewhat different question—why it is that Ukraine’s oligarchs do not organize collectively to improve property rights and generally reduce the risk of predation. After all, democratization and other regime change is often driven by intra-elite conflict, as rising elites act to protect their holdings from autocratic rulers and their vassals (North and Weingast, 1989; North, 1990; Ansell and Samuels, 2014).

One possibility is that politically connected oligarchs may mistakenly assume that they will retain the protection of those in power, only to find that the connections on which they relied have disappeared. When regime change occurs quickly, as in Ukraine during the Orange Revolution, outgoing elites may find it difficult to influence the design of new institutions to protect their interests (Albertus and Menaldo, 2018). From this perspective, the greater propensity of Blue oligarchs to obscure ownership after the Orange Revolution may have been a second-best solution to the problem of expropriation, given the constraint of having been caught flat-footed.

Sonin (2003) offers a different answer: the rich benefit from weak protection of property rights, as they can exploit such weakness to expropriate other economic actors. Nonetheless, this strategy is risky, to the extent that they are subject to predation by other members of the political or economic elite. Our work, and that of others cited above, suggests that

such risks can be reduced through private actions to reduce the risk of predation, such as obscuring ownership behind related individuals, shell companies, and offshore firms. To the extent that these strategies are successful, the risk of actual expropriation may be relatively small, raising the benefits to oligarchs of weak property rights, relative to their costs.<sup>15</sup>

Such behavior may be not only individually rational, but also collectively optimal, from the perspective of the oligarchy. The consequences for the broader economy, however, are potentially ruinous. As our analysis of a large sample of joint stock companies illustrates, many firms do not take advantage of the various strategies to obscure ownership commonly employed by oligarchs. For these non-oligarch actors, an equilibrium of weak institutions implies reduced incentives to invest, seek out new markets, and otherwise take actions to improve economic performance.

## References

- Acemoglu, Daron and James A. Robinson. 2006. *Economic Origins of Dictatorship and Democracy*. Cambridge: Cambridge University Press.
- Acemoglu, Daron and Simon Johnson. 2005. “Unbundling Institutions.” *Journal of Political Economy* 113(5):949–995.
- Albertus, Michael and Victor Menaldo. 2018. *Authoritarianism and the Elite Origins of Democracy*. New York: Cambridge University Press.
- Ananyev, Maxim. 2018. “Political Economy of Cross-Border Income Shifting: A Protection Racket Approach.” Unpublished manuscript.

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<sup>15</sup>As with capital flight or “income shifting” (Ananyev, 2018), obscuring ownership places an upper bound on confiscatory taxation or outright expropriation used to fund redistribution. In principle, this could encourage elites to support democratizing reforms that increase the power of the median voter (Rogowski, 1998; Boix, 2003; Acemoglu and Robinson, 2006). In practice, as emphasized by Ansell and Samuels (2014), fear of other elites is often more important in countries such as Ukraine than is fear of the masses; see also Svoboda (2012).

- Angrist, Joshua D and Jörn-Steffen Pischke. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.
- Ansell, Ben W. and David J. Samuels. 2014. *Inequality and Democratization*. New York: Cambridge University Press.
- Åslund, Anders. 2005. "The Economic Policy of Ukraine after the Orange Revolution." *Eurasian Geography and Economics* 46(5):327–353.
- Åslund, Anders. 2009. *How Ukraine Became a Market Economy and Democracy*. Washington, DC: Peterson Institute for International Economics.
- Barnes, Andrew. 2019. "The Politics of Economics: Lessons from the Persistence and Variability of Oligarchy in the Post-Communist World." Unpublished manuscript.
- Boix, Carles. 2003. *Democracy and Redistribution*. Cambridge: Cambridge University Press.
- Brown, J. David, John S. Earle, Solomiya Shpak and Volodymyr Vakhitov. 2018. "Is Privatization Working in Ukraine? New Estimates from Comprehensive Manufacturing Firm Data, 1989–2013." *Comparative Economic Studies* 61(1):1–35.
- Bueno de Mesquita, Bruce and Hilton L. Root, eds. 2000. *Governing for Prosperity*. New Haven: Yale University Press.
- Chernozhukov, Victor and Christian Hansen. 2008. "The Reduced Form: A Simple Approach to Inference with Weak Instruments." *Economics Letters* 100(1):68–71.
- Coase, Ronald. 1937. "The Nature of the Firm." *Economica* 4(16):386–405.
- Demsetz, Harold and Kenneth Lehn. 1985. "The Structure of Corporate Ownership: Causes and Consequences." *Journal of Political Economy* 93(6):1155–77.
- Denisova, Irina, Markus Eller, Timothy Frye and Ekaterina V. Zhuravskaya. 2009. "Who Wants to Revise Privatization? The Complementarity of Market Skills and Institutions." *American Political Science Review* 103(2):284–304.
- Earle, John S. and Scott Gehlbach. 2015. "The Productivity Consequences of Political Turnover: Firm-Level Evidence from Ukraine." *American Journal of Political Science* 59(3):708–723.

- Faccio, Mara. 2006. "Politically Connected Firms." *American Economic Review* 96:369–386.
- Fisman, David, Raymond J. Fisman, Julia Galef, Rakesh Khurana and Yongxiang Wang. 2012. "Estimating the Value of Connections to Vice-President Cheney." *The B.E. Journal of Economic Analysis & Policy* 13(3):Article 5.
- Fisman, Raymond. 2001. "Estimating the Value of Political Connections." *American Economic Review* 91(4):1095–1102.
- Frye, Timothy. 2006. "Original Sin, Good Works, and Property Rights in Russia." *World Politics* 58(4):479–504.
- Frye, Timothy. 2017. *Property Rights and Property Wrongs: How Power, Institutions, and Norms Shape Economic Conflict in Russia*. New York: Cambridge University Press.
- Frye, Timothy and Ekaterina Zhuravskaya. 2000. "Rackets, Regulation, and the Rule of Law." *The Journal of Law, Economics, and Organization* 16(2):478–502.
- Gans-Morse, Jordan. 2017a. "Demand for Law and the Security of Property Rights: The Case of Post-Soviet Russia." *American Political Science Review* 111(2):338–359.
- Gans-Morse, Jordan. 2017b. *Property Rights in Post-Soviet Russia: Violence, Corruption, and the Demand for Law*. New York: Cambridge University Press.
- Gehlbach, Scott, Konstantin Sonin and Ekaterina Zhuravskaya. 2010. "Businessman Candidates." *American Journal of Political Science* 54(3):718–736.
- Gorodnichenko, Yuriy and Yegor Grygorenko. 2008. "Are Oligarchs Productive? Theory and Evidence." *Journal of Comparative Economics* 36(1):17–42.
- Grossman, Sanford and Oliver Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Lateral and Vertical Integration." *Journal of Political Economy* 94(4):691–719.
- Guriev, Sergei and Andrei Rachinsky. 2005. "The Role of Oligarchs in Russian Capitalism." *Journal of Economic Perspectives* 19(1):131–150.
- Haber, Stephen, Armando Razo and Noel Maurer. 2003. *The Politics of Property Rights: Political Instability, Credible Commitments, and Economic Growth in Mexico, 1876–1929*. Cambridge: Cambridge University Press.

- Hale, Henry E. 2005. "Regime Cycles: Democracy, Autocracy, and Revolution in Post-Soviet Eurasia." *World Politics* 58(1):133–165.
- Hart, Oliver and John Moore. 1990. "Property Rights and the Nature of the Firm." *Journal of Political Economy* 98(6):1119–1158.
- Hendley, Kathryn, Barry W. Ickes, Peter Murrell and Randi Ryterman. 1997. "Observations on the Use of Law by Russian Enterprises." *Post-Soviet Affairs* 13(1):19–41.
- Hendley, Kathryn, Peter Murrell and Randi Ryterman. 2001. Law Works in Russia: The Role of Legal Institutions in the Transactions of Russian Enterprises. In *Assessing the Value of Law in Transition Economies*, ed. Peter Murrell. Ann Arbor: University of Michigan Press pp. 56–93.
- Katchanovski, Ivan. 2008. "The Orange Evolution? The 'Orange Revolution' and Political Changes in Ukraine." *Post-Soviet Affairs* 24(4):351–382.
- La Porta, Rafael, Florencio Lopez-de Silanes and Andrei Shleifer. 1999. "Corporate ownership around the world." *Journal of Finance* 54(2):471–517.
- Lamberova, Natalia and Konstantin Sonin. 2018. "Economic Transition and the Rise of Alternative Institutions: Political Connections in Putin's Russia." *Economics of Transition* 26(4):615–648.
- Makarin, Alexey and Vasily Korovkin. 2018. "Conflict and Trade: Evidence from Russian-Ukrainian Trade Transactions." Unpublished manuscript.
- Markus, Stanislav. 2015. *Property, Predation, and Protection*. New York: Cambridge University Press.
- Markus, Stanislav and Volha Charnysh. 2017. "The Flexible Few: Oligarchs and Wealth Defense in Developing Democracies." *Comparative Political Studies* 50(12):1632–1665.
- North, Douglass C. 1981. *Structure and Change in Economic History*. New York: W.W. Norton and Company.
- North, Douglass C. 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge: Cambridge University Press.

- North, Douglass C. and Barry R. Weingast. 1989. "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century England." *Journal of Economic History* 49(4):803–832.
- North, Douglass C., John Joseph Wallis and Barry R. Weingast. 2009. *Violence and Social Orders: A Conceptual Framework for Interpreting Recorded Human History*. New York: Cambridge University Press.
- Obermayer, Bastian and Frederik Obermaier. 2016. *The Panama Papers: Breaking the Story of How the Rich and Powerful Hide Their Money*. London: Oneworld Publications.
- Olson, Mancur. 1993. "Dictatorship, Democracy, and Development." *American Political Science Review* 87(3):567–576.
- Paskhaver, O., L. Verkhovodova and K. Ageeva. 2006. *Pryvatyzatsiia ta reprivatyzatsiia v Ukraini pislia 'pomaranchevoi' revoliutsii*. Kiev: Milenium.
- Razo, Armando. 2008. *Social Foundations of Limited Dictatorship: Networks and Private Protection during Mexico's Early Industrialization*. Stanford, CA: Stanford University Press.
- Rogowski, Ronald. 1998. Democracy, Capital, Skill, and Country Size: Effects of Asset Mobility and Regime Monopoly on the Odds of Democratic Rule. In *The Origins of Liberty*, ed. Paul W. Drake and Mathew D. McCubbins. Princeton, NJ: Princeton University Press.
- Shleifer, Andrei. 1997. "Government in Transition." *European Economic Review* 41(3-5):385–410.
- Shleifer, Andrei and Robert W. Vishny. 1994. "Politicians and Firms." *Quarterly Journal of Economics* 109(4):995–1025.
- Sonin, Konstantin. 2003. "Why the Rich May Favor Poor Protection of Property Rights." *Journal of Comparative Economics* 31(4):715–731.
- Svolik, Milan. 2012. *The Politics of Authoritarian Rule*. New York: Cambridge University Press.
- Szakonyi, David. 2018. "Businesspeople in Elected Office: Identifying Private Benefits from

- Firm-Level Returns.” *American Political Science Review* 112(2):322–338.
- Treisman, Daniel. 2016. “Russia’s Billionaires.” *American Economic Review* 106(5):236–41.
- Volkov, Vadim. 2002. *Violent Entrepreneurs: The Use of Force in the Making of Russian Capitalism*. Ithaca, NY: Cornell University Press.
- Williamson, Oliver. 1985. *The Economic Institutions of Capitalism*. New York: Free Press.
- Zucman, Gabriel. 2013. “The Missing Wealth of Nations: Are Europe and the U.S. Net Debtors or Net Creditors?” *Quarterly Journal of Economics* 128(3):1321–1364.
- Zucman, Gabriel. 2014. “Taxing across Borders: Tracking Personal Wealth and Corporate Profits.” *Journal of Economic Perspectives* 28(4):121–48.
- Zucman, Gabriel. 2015. *The Hidden Wealth of Nations: The Scourge of Tax Havens*. Chicago: University of Chicago Press.

## Online Appendix to “Obfuscating Ownership”

John S. Earle, Scott Gehlbach, Anton Shirikov, and Solomiya Shpak

### Ownership algorithm

In this section we describe in detail the algorithm by which we establish the ownership chains of oligarch-controlled firms at various points in time.

For our baseline analysis, the algorithm proceeds as follows: Beginning with a Ukrainian domestic firm (in the first iteration, a firm from the Delo list or from *Ukrains’ka Pravda*), we ascertain whether this firm exists in JSCReg as of April 1, 2004—the last record date before the 2004 Ukrainian presidential campaign began in earnest. If so, we extract all corporate owners, domestic and foreign, from JSCReg. Foreign owners in JSCReg do not have unique identification codes systematically assigned to them, but JSCReg includes information on their country of registration, which we use to classify owners as “offshore” and/or “foreign”. If JSCReg indicates that the firm has individual owners, we search SReg specifically for such owners. We limit searches in SReg to ownership transactions between January 1, 1999 and April 1, 2004: extending the search further into the 1990s would likely generate many false positives, as this was the period of privatization and initial share consolidation, when shares could change hands several times. Finally, if a firm is not in JSCReg, we extract its corporate and individual owners from SReg.

We compile a list of all Ukrainian firms that emerge as owners from this iteration, eliminating entities which are not relevant or might generate more false positives, such as state agencies and charity organizations. We then repeat the process, continuing until we can identify no further Ukrainian corporate owners. (Individual and foreign owners represent the end of the observable ownership chain.) Eight iterations are needed to complete this process, although the overwhelming majority of nodes in our network are added in the first five steps.

To identify oligarchs in the ownership chain of any firm, we check identification codes for individual owners against a list of such codes associated with individual oligarchs from Delo

and *Ukrains'ka Pravda*. We establish this list by extracting from SReg all Derzhkomstat-issued owner identification codes belonging to Ukrainian individuals, following which we match the names associated with these codes with names from our oligarch list (by first name, patronymic, and last name). We perform this matching manually, which allows us to account for different spellings (in Ukrainian and Russian) of oligarch names, as well as for typos and misspellings. Some oligarchs happen to have multiple owner codes in SReg, perhaps reflecting multiple registrations at different points in time.

It is very unlikely that this labor-intensive process would have missed any identification codes for oligarchs listed in Delo and *Ukrains'ka Pravda*, unless the names associated with those codes were grossly misspelled. We additionally examine the resulting list of codes to ensure that they indeed belong to oligarchs and not to irrelevant individuals who happen to have the same names. In doing so, we rely on three matching criteria. First, we examine the postal address associated with a code. In most cases, we do not know oligarchs' exact addresses, but we do know the cities or towns in which they reside, which allows us to rule out certain individuals. Further, if we have established that a certain code belongs to an oligarch, then if we find another individual with a different code, but with the same name and address, we infer that the latter code belongs to the same oligarch. Second, we check for ownership of firms commonly associated with a given oligarch group. For example, if an individual in SReg has the same name as oligarch A and also owns firms that journalists attribute to the oligarch group of oligarch A, this increases our confidence that the code indeed belongs to oligarch A. Third, we examine patterns of co-ownership: if an individual in SReg shares a name with an oligarch from some group X, and this individual owns a firm that other members of group X also own, this also increases our confidence in the match. If in doubt, as was true for a small number of cases, we drop the code to avoid false positives.

For some analyses we additionally focus on changes in ownership from 2004 to 2006. Our method for identifying ownership chains in 2006 is analogous to that for 2004, though for these exercises we additionally identify ownership chains using data only from JSCReg,

given the greater difficulty in observing changes in ownership structure using SReg. For these analyses, we capture the ownership structure in JSCReg as of the record date November 10, 2006. We limit our search in SReg to transactions between January 1, 1999 and November 10, 2006.

Similarly, for our “placebo” analyses, where we examine changes from 2002 to 2004, we capture the ownership structure in JSCReg as of the record date May 11, 2002. We limit our search in SReg to transactions between January 1, 1999 and May 11, 2002.

Finally, for analyses that rely solely on the JSCReg data, we simply extract ownership records of all firms reported in JSCReg as of a particular date, excluding irrelevant owners, as described above. We then use the network constructed from these entries to establish whether foreign and offshore corporate entities are present in the ownership chains of oligarch-controlled firms (for the exercises in Tables A5 and A7) or the full population of JSCReg firms (Tables 9 and 10).

**Table A1: First-stage results**

	(1)	(2)	(3)
Vote for Yushchenko	0.914** (0.348)	0.903** (0.350)	0.820** (0.363)
Employment	0.035 (0.036)	0.032 (0.036)	0.029 (0.041)
TFP	-0.034 (0.028)	-0.032 (0.028)	-0.020 (0.046)
Privatized	0.035 (0.155)	0.042 (0.152)	0.112 (0.167)
Sector FEs	Yes	Yes	Yes
Observations	329	327	253

Notes: First-stage regressions from corresponding instrumental-variables regressions in Table 4 and 5 (Column 1), Table 8 (Column 2), and Table A5 (Column 3). In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level. Significance levels: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table A2: Number of firms with foreign and offshore owners, JSCReg only**

	2004	2006
Foreign	131	140
Blue	66	72
Orange	48	50
Gray	17	18
Offshore	74	107
Blue	33	57
Orange	36	37
Gray	5	13

Note: Ownership information derived only from JSCReg: see text for details.

**Table A3: Number of firms with foreign and offshore owners, by oligarch group**

	Baseline				JSCReg only			
	Foreign		Offshore		Foreign		Offshore	
	2004	2006	2004	2006	2004	2006	2004	2006
<i>Aval</i>	7	6	6	4	6	5	5	4
Basis	0	0	0	0	0	0	0	0
<i>Brinkford</i>	4	5	1	1	4	5	0	1
<b>Andriy Derkach</b>	0	0	0	0				
<b>Energo</b>	9	9	8	9	3	1	3	1
Oleksandr Feldman	0	0	0	0	0	0		
<i>Finansy i Kredyt</i>	8	9	2	3	6	7	2	2
<b>Franchuk brothers</b>	0	0	0	0	0	0	0	0
ISD	11	16	3	14	7	9	2	7
Intercontact	1	1	0	1	1	1	0	1
Interpipe	31	34	18	30	23	20	10	17
<b>Vasyl Khmelnytskyi</b>	2	2	1	1	2	2	1	1
<b>Kliuev brothers</b>	2	1	1	1	2	1	1	1
<b>Kyiv-Seven</b>	26	24	14	16	22	20	12	14
<b>“Old Donetsk”</b>	1	0	0	0	1	0	0	0
<i>Orlan</i>	3	3	2	2	1	1	1	1
<i>Pryvat</i>	23	28	21	24	20	21	18	19
<b>Radon</b>	1	0	0	0	1			
<b>SCM</b>	14	33	9	27	10	24	5	20
<b>TAS</b>	1	3	0	1	0	1	0	1
<b>Dmytro Tabachnyk</b>	1	1	1	1				
<i>Oleksandr Tretiakov</i>	0	0	0	0				
<i>UkrPromInvest</i>	18	18	17	18	11	11	10	10
UkrSotsBank	5	6	4	6	3	3	2	3
UkrSybBank	8	9	4	7	5	4	1	1
<b>Ukrinterproduct</b>	11	12	10	12	2	3	1	2
ISD/Pryvat	1	1	0	1	1	1	0	1
SCM/ISD	0	0	0	0	0	0	0	0
<b>Total</b>	<b>188</b>	<b>221</b>	<b>122</b>	<b>179</b>	<b>131</b>	<b>140</b>	<b>74</b>	<b>107</b>

Note: Blue oligarch groups in bold, Orange oligarch groups in italics, and Gray oligarch groups in plain text. Empty cells indicate no ownership information.

**Table A4: Ownership transitions, 2004 to 2006, JSCReg only**

	DO, NOFF				
	DO → FO	→ OFF	DO → OFF	NOFF → OFF	FO → DO
All	0.279	0.302	0.246	0.421	0.191
Blue	0.377	0.372	0.328	0.455	0.258
Orange	0.240	0.216	0.200	0.250	0.083
Gray	0.139	0.229	0.139	0.500	0.235

Notes: Ownership information derived only from JSCReg: see text for details. Proportion of firms transitioning to/from: domestic ownership only (DO), foreign ownership (FO), foreign but only non-offshore ownership (NOFF), and foreign offshore ownership (OFF).

Table A5: Change in foreign/offshore owners, 2004 to 2006, JSCReg only

	(1)	(2)		(3)	(4)		(5)	(6)		(7)	(8)
	OLS	OLS	IV	IV	Reduced	OLS	OLS	OLS	IV	Reduced	
Orange	-0.048 (0.121)					-0.197** (0.083)					
Gray	-0.026 (0.118)					-0.042 (0.091)					
Color		-0.024 (0.063)	-0.044 (0.129)				-0.095** (0.042)	-0.020 (0.151)			
Vote for Yushchenko					-0.036 (0.116)						-0.016 (0.133)
Employment	-0.007 (0.013)	-0.007 (0.012)	-0.007 (0.012)		-0.009 (0.013)	0.008 (0.015)	0.008 (0.016)	0.009 (0.015)		0.008 (0.018)	
TFP	-0.010 (0.009)	-0.010 (0.008)	-0.010 (0.008)		-0.009 (0.007)	0.012 (0.018)	0.010 (0.018)	0.011 (0.018)		0.012 (0.017)	
Privatized	0.038 (0.094)	0.038 (0.094)	0.040 (0.091)		0.035 (0.094)	0.097 (0.074)	0.099 (0.075)	0.092 (0.077)		0.090 (0.074)	
Sector FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	253	253	253	253	253	253	253	253	253	253	253

Notes: Ownership information derived only from JSCReg; see text for details. Dependent variable is change in presence of foreign owner (columns 1-4) and offshore owner (columns 5-8) in ownership chain, 2004 to 2006. In Columns 1 and 5, the excluded political affiliation is Blue. In Columns 3 and 7, Color (0 = Blue, 1 = Gray, 2 = Orange) is instrumented with province-level vote for Yushchenko in do-over second round of 2004 presidential election. Columns 4 and 8 are corresponding reduced-form regressions. First-stage  $F$ -statistic = 5.12; complete first-stage results reported in appendix. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level. Significance levels: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table A6: Change in foreign/offshore owners, 2002 to 2004 (placebo)**

	(1)	(2)		(3)	(4)		(5)	(6)		(7)	(8)
	OLS	OLS	IV	IV	Reduced	Reduced	OLS	OLS	IV	Reduced	
Orange	-0.060 (0.128)						0.096 (0.149)				
Gray	0.026 (0.120)						0.065 (0.121)				
Color		-0.027 (0.067)	-0.020 (0.177)					0.049 (0.075)	0.081 (0.193)		
Vote for Yushchenko					-0.018 (0.161)						0.072 (0.192)
Employment	-0.025 (0.023)	-0.025 (0.022)	-0.025 (0.022)		-0.026 (0.026)		-0.041* (0.022)	-0.042* (0.022)	-0.042* (0.022)	-0.039 (0.025)	
TFP	0.029 (0.018)	0.027 (0.016)	0.027 (0.019)		0.028* (0.016)		0.019 (0.019)	0.018 (0.018)	0.019 (0.021)	0.016 (0.016)	
Privatized	-0.164 (0.109)	-0.168 (0.106)	-0.168 (0.102)		-0.168 (0.107)		-0.215* (0.115)	-0.216* (0.111)	-0.215* (0.110)	-0.215* (0.112)	
Sector FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	310	310	310	310	310	310	310	310	310	310	310

Notes: Dependent variable is change in presence of foreign owners (columns 1–4) and offshore owners (columns 5–8) in ownership chain, 2002 to 2004. In Columns 1 and 5, the excluded political affiliation is Blue. In Columns 3 and 7, Color (0 = Blue, 1 = Gray, 2 = Orange) is instrumented with province-level vote for Yushchenko in do-over second round of 2004 presidential election. Columns 4 and 8 are corresponding reduced-form regressions. First-stage  $F$ -statistic = 6.11; complete first-stage results reported in appendix. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level. Significance levels: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table A7: Change in foreign/offshore owners, 2002 to 2004 (placebo), JSCReg only**

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	OLS	OLS	OLS	OLS	IV	IV	Reduced	Reduced	OLS	OLS	OLS	OLS	IV	IV	Reduced	Reduced
Orange	-0.108 (0.111)								-0.001 (0.104)							
Gray	0.015 (0.105)								0.038 (0.051)							
Color		-0.051 (0.058)			-0.048 (0.142)						0.002 (0.051)		-0.049 (0.145)			
Vote for Yushchenko							-0.038 (0.111)								-0.039 (0.107)	
Employment	-0.010 (0.022)	-0.010 (0.022)	-0.010 (0.022)	-0.010 (0.022)	-0.010 (0.022)	-0.010 (0.022)	-0.012 (0.023)	-0.012 (0.023)	-0.020 (0.025)	-0.020 (0.025)	-0.020 (0.025)	-0.020 (0.025)	-0.019 (0.022)	-0.019 (0.022)	-0.021 (0.026)	-0.021 (0.026)
TFP	-0.002 (0.025)	-0.004 (0.025)	-0.004 (0.025)	-0.004 (0.025)	-0.004 (0.025)	-0.004 (0.025)	-0.003 (0.026)	-0.003 (0.026)	0.010 (0.032)	0.010 (0.032)	0.009 (0.031)	0.009 (0.031)	0.008 (0.029)	0.008 (0.029)	0.000 (0.031)	0.000 (0.031)
Privatized	0.048 (0.075)	0.049 (0.075)	0.049 (0.072)	0.049 (0.072)	0.049 (0.072)	0.049 (0.072)	0.042 (0.073)	0.042 (0.073)	-0.037 (0.071)	-0.037 (0.071)	-0.036 (0.072)	-0.036 (0.072)	-0.031 (0.069)	-0.031 (0.069)	-0.037 (0.075)	-0.037 (0.075)
Sector FEs	Yes															
Observations	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237	237

Notes: Ownership information derived only from JSCReg: see text for details. Dependent variable is change in presence of foreign owners (columns 1-4) and offshore owners (columns 5-8) in ownership chain, 2002 to 2004. In Columns 1 and 5, the excluded political affiliation is Blue. In Columns 3 and 7, Color (0 = Blue, 1 = Gray, 2 = Orange) is instrumented with province-level vote for Yushchenko in do-over second round of 2004 presidential election. Columns 4 and 8 are corresponding reduced-form regressions. First-stage  $F$ -statistic = 4.56; complete first-stage results reported in appendix. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level. Significance levels: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .