The Oligarch Vanishes: Defensive Ownership, Property Rights, and Political Connections: Online Appendix

John S. Earle (r) Solomiya Shpak (r) Anton Shirikov (r) Scott Gehlbach

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Formal theoretical framework

We formalize the arguments in the section "Motivation and Theoretical Framework" with the following decision-theoretic model. An "oligarch" invests in a level of defensive ownership $\omega \in [0, \infty)$ to maximize

$$[1 - P(\omega; \chi)] \cdot [\pi - C(\omega; \chi)], \tag{A1}$$

where $P(.)$ is the probability of successful seizure by a private or state actor, such that the oligarch completely loses the firm, or equivalently the fraction of the firm's value that the oligarch can expect to lose to seizure; χ measures the strength of the political connections of the oligarch; π is the baseline value of the firm; and $C(.)$ is the cost of defensive ownership, including all legal, transaction, and opportunity costs (e.g., foregone opportunities for expansion or increasing productivity). We assume that $P(.)$ is strictly decreasing and twice continuously differentiable in ω, with $P_{\omega\omega} > 0$, where subscripts denote derivatives. The assumption that $P(.)$ is convex in ω implies diminishing marginal returns to defensive ownership. Similarly, we assume that $C(.)$ is strictly increasing and twice continuously differentiable in ω, with $C_{\omega\omega} > 0$, such that there are increasing marginal costs of defensive ownership.

The assumption that the risk of seizure is responsive to both defensive ownership and political connections captures a range of phenomena, including legal assault by a competitor with the assistance of state authorities, arbitrary taxation, breach of contract, and outright nationalization. The extent of that responsiveness depends in the first case on the effectiveness of defensive ownership in altering the costs and effectiveness of seizure, and in the second on whether laws and enforcement are subject to manipulation by those with political power in favor of some and against others.

In general, the relationship between the optimal level of defensive ownership and the political connections of the oligarch depends on the shape of the functions $P(.)$ and $C(.)$ with respect to χ. We assume that $P(.)$ is differentiable and decreasing in χ: connections protect the firm from seizure. Also plausible is that $P_{\omega\chi} \geq 0$, implying that defensive ownership and connections are not complementary in reducing the risk of seizure (from the perspective of the oligarch). Intuitively, the marginal benefit of defensive ownership may be lower for a firm with strong political protection. Finally, we may anticipate that the marginal cost of defensive ownership is less for oligarchs who are better connected—for example, because access to politically directed credits reduces the benefits of transparency, or because connected oligarchs are protected from criminal prosecution—which implies $C_{\omega\chi} < 0$ and, for $\omega > 0$, $C_\chi < 0$.

In what follows, we suppress the arguments of $P(.)$ and $C(.)$ for notational simplicity. At an interior solution, the optimal level of defensive ownership ω^* equates the marginal benefit and marginal cost of defensive ownership.[1]

$$-P_\omega(\pi - C) = C_\omega(1 - P). \tag{A2}$$

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[1]To see that this is sufficient for a solution, observe that the second derivative of Expression A1 with respect to ω 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 ω and that C is strictly increasing and convex in ω.

Our primary interest is in the relationship between the optimal level of defensive ownership ω^* and the oligarch's political connections χ. To derive this, we implicitly differentiate Equation A2 with respect to χ:

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

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,

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

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

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

represent their complementarity. The net impact of political connections on defensive ownership follows from comparison of these two quantities.

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 *Ukraïns'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 that are not relevant or might generate more false positives (spurious ownership links), such as state agencies and charities. 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.

For 2004, there are in total 2414 nodes in the full network (i.e., all ownership chains for the 376 firms in the Delo/*Ukraïns'ka Pravda* sample which are present in either JSCReg or SReg), of which 937 are Ukrainian firms, 350 are foreign firms, 1107 are Ukrainian individuals, and 20 are foreign individuals. For 2006, there are 3297 nodes in total, of which 1092 are Ukrainian firms, 619 are foreign firms, 1616 are Ukrainian individuals, and 36 are foreign individuals. Among the individual owners, 21 (27 in 2006) are members of oligarch clans (see just below); we also observe a number of relatives and known associates of oligarchs.

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 *Ukraïns'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 *Ukraïns'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 an oligarch's exact address, but we do know the city or town in which he resides, 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 is 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 (Tables 5–8) or the full population of JSCReg firms (Tables A9 and A10).

Additional tables

Table A1: Number of firms with owners in foreign locations

	Number of firms		Share	
	2004	2006	2004	2006
Offshore locations	126	172	0.421	0.575
Cyprus	72	107	0.241	0.358
British Virgin Islands	64	78	0.214	0.261
Panama	23	21	0.077	0.070
Isle of Man	17	17	0.057	0.057
Bahamas	15	14	0.050	0.047
Belize	14	26	0.047	0.087
Gibraltar	7	16	0.023	0.054
Other offshore	19	16	0.064	0.054
Non-offshore locations	140	132	0.468	0.441
United Kingdom	78	80	0.261	0.268
United States	66	56	0.221	0.187
Netherlands	23	36	0.077	0.120
Switzerland	17	11	0.057	0.037
Spain	13	6	0.043	0.020
Other non-offshore	50	41	0.167	0.137

Notes: Number of firms with foreign owners in the indicated country, for countries with at least ten firms in the sample in either of two periods. Shares based on regression sample of 299 firms. Firms can have foreign owners in multiple countries and both offshore and non-offshore foreign owners.

Table A2: Number of firms with defensive ownership, by oligarch group

	No oligarch 2004	Foreign 2004	Foreign 2006	Offshore 2004	Offshore 2006	Oligarch sample	Foreign sample
Aval	12	7	6	6	4	15	14
Basis	0	0	0	0	0	2	2
Brinkford	6	4	5	1	1	6	6
Andriy Derkach	0	0	0	0	0	1	1
Energo	9	9	9	8	9	9	9
Oleksandr Feldman	1	0	0	0	0	2	2
Finansy i Kredyt	10	8	9	2	3	13	11
Franchuk brothers	2	0	0	0	0	2	2
Intercontact	1	1	1	0	1	1	1
Interpipe	26	31	33	18	29	38	36
ISD	19	11	16	3	14	29	29
Vasyl Khmelnytskyi	2	2	2	2	1	2	2
Kliuev brothers	3	2	1	1	1	3	2
Kyiv-Seven	24	26	24	14	16	26	26
"Old Donetsk"	6	1	0	0	0	6	5
Orlan	1	3	3	2	2	3	3
Pryvat	35	23	23	22	21	39	29
Radon	0	1	0	0	0	1	1
SCM	20	14	31	10	25	52	45
Dmytro Tabachnyk	1	1	1	1	1	1	1
TAS	0	1	3	1	1	9	9
Oleksandr Tretiakov	1	0	0	0	0	1	1
Ukrinterproduct	6	11	12	10	12	15	14
UkrPromInvest	19	18	18	17	18	20	20
UkrSotsBank	11	5	5	4	5	11	10
UkrSybBank	18	8	9	4	7	20	16
ISD/Pryvat	0	1	1	0	1	1	1
SCM/ISD	0	0	0	0	0	1	1
Total	**233**	**188**	**212**	**126**	**172**	**329**	**299**

Note: Blue oligarch groups in bold, Orange oligarch groups in italics, and Gray oligarch groups in plain text. The last two columns report the total number of firms linked to each oligarch group in the regression analysis of no oligarch in chain/distance to oligarch and foreign/offshore in chain, respectively.

Table A3: First-stage results

	(1)	(2)
Vote for Yushchenko	0.483	0.465
	(0.152)	(0.154)
Gray	−0.335	−0.320
	(0.134)	(0.132)
Employment	0.019	0.011
	(0.018)	(0.015)
TFP	−0.010	−0.006
	(0.015)	(0.014)
Privatized	0.032	0.053
	(0.077)	(0.080)
Sector FEs	Yes	Yes
Observations	329	299

Notes: First-stage regressions from corresponding instrumental-variables regressions in Table 4. Instrumented variable is Orange. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level.

Table A4: Oligarch in ownership chain (dropping firms with no owners), 2004

	(1)	(2)	(3)	(4)
	No oligarch in chain		Distance to oligarch	
	OLS	IV	OLS	IV
Orange	0.310	0.601	0.143	0.225
	(0.115)	(0.302)	(0.063)	(0.146)
Gray	0.188	0.299	0.103	0.134
	(0.140)	(0.161)	(0.065)	(0.078)
Employment	−0.002	0.001	−0.002	−0.002
	(0.016)	(0.015)	(0.007)	(0.007)
TFP	0.025	0.027	0.006	0.007
	(0.017)	(0.018)	(0.010)	(0.011)
Privatized	0.187	0.177	0.096	0.093
	(0.099)	(0.117)	(0.044)	(0.048)
Sector FEs	Yes	Yes	Yes	Yes
Observations	299	299	299	299
First-stage F-stat		9.11		9.11
Vote for Yushchenko		0.279		0.105
(reduced form)		(0.137)		(0.072)

Notes: Dependent variable is absence of controlling oligarch in ownership chain (columns 1–2) and $1 − 1/$(steps to oligarch) (columns 3–4; see text for details). Province-level vote for Yushchenko in do-over second round of 2004 presidential election instruments Orange in Columns 2 and 4; the effect of Gray is unidentified in these regressions. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level.

Table A5: Any oligarch in ownership chain, 2004

	(1)	(2)	(3)	(4)
	No oligarch in chain		Distance to oligarch	
	OLS	IV	OLS	IV
Orange	0.282	0.642	0.134	0.246
	(0.092)	(0.271)	(0.054)	(0.123)
Gray	0.059	0.196	0.061	0.104
	(0.158)	(0.156)	(0.069)	(0.071)
Employment	−0.006	−0.005	−0.004	−0.004
	(0.016)	(0.016)	(0.007)	(0.007)
TFP	0.018	0.022	0.003	0.004
	(0.019)	(0.019)	(0.011)	(0.011)
Privatized	0.228	0.225	0.116	0.115
	(0.090)	(0.103)	(0.043)	(0.044)
Sector FEs	Yes	Yes	Yes	Yes
Observations	329	329	329	329
First-stage F-stat		10.09		10.09
Vote for Yushchenko		0.310		0.119
(reduced form)		(0.106)		(0.055)

Notes: Dependent variable is absence of any oligarch in ownership chain (columns 1–2) and $1 - 1/$(steps to oligarch) (columns 3–4). The excluded political affiliation is Blue. Province-level vote for Yushchenko in do-over second round of 2004 presidential election instruments Orange in Columns 2 and 4; the effect of Gray is unidentified in these regressions. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level.

Table A6: Defensive ownership and language, 2004

	(1) No Oligarch IV	(2) Distance IV	(3) Foreign IV	(4) Offshore IV
Orange	0.561	0.240	0.549	0.321
	(0.220)	(0.099)	(0.305)	(0.272)
Gray	0.273	0.136	−0.033	−0.185
	(0.136)	(0.061)	(0.149)	(0.148)
Employment	−0.000	−0.001	0.052	0.023
	(0.014)	(0.007)	(0.024)	(0.022)
TFP	0.024	0.005	0.014	−0.004
	(0.018)	(0.011)	(0.018)	(0.017)
Privatized	0.212	0.114	0.000	−0.090
	(0.088)	(0.040)	(0.098)	(0.101)
Sector FEs	Yes	Yes	Yes	Yes
Observations	329	329	299	299
First-stage F-stat	10.18	10.18	8.87	8.87
Share of Russian language	−0.364	−0.156	−0.342	−0.200
(reduced form)	(0.135)	(0.063)	(0.176)	(0.176)

Notes: Dependent variable is absence of oligarch in ownership chain (column 1), $1 - 1/$(steps to oligarch) (column 2; see text for details), presence of foreign entity in ownership chain (column 3), and presence of offshore entity in ownership chain (column 4). The excluded political affiliation is Blue. Province-level share of the population speaking Russian as a native language instruments Orange; the effect of Gray is unidentified in these regressions. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level.

Table A7: Defensive ownership within macro-region, 2004

	(1) No oligarch in chain OLS	(2) Distance to oligarch OLS	(3) Foreign in chain OLS	(4) Offshore in chain OLS
Orange	0.252	0.121	0.107	0.167
	(0.101)	(0.060)	(0.132)	(0.116)
Gray	0.169	0.095	−0.187	−0.243
	(0.121)	(0.059)	(0.133)	(0.103)
Employment	0.005	0.000	0.053	0.022
	(0.015)	(0.007)	(0.020)	(0.022)
TFP	0.021	0.004	0.011	−0.005
	(0.018)	(0.011)	(0.018)	(0.017)
Privatized	0.211	0.112	0.022	−0.087
	(0.073)	(0.036)	(0.093)	(0.104)
Western	0.192	0.097	−0.062	−0.013
	(0.071)	(0.039)	(0.115)	(0.119)
Eastern	−0.041	0.001	−0.091	−0.002
	(0.086)	(0.047)	(0.085)	(0.084)
Southern	0.119	0.094	−0.161	−0.218
	(0.125)	(0.054)	(0.116)	(0.102)
Sector FEs	Yes	Yes	Yes	Yes
Observations	329	329	299	299

Notes: Dependent variable is absence of controlling oligarch in ownership chain (column 1), $1 - 1/$(steps to oligarch) (column 2; see text for details), presence of foreign entity in ownership chain (column 3), and presence of offshore entity in ownership chain (column 4). The excluded political affiliation is Blue and excluded macro-region is Central. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level.

Table A8: Defensive ownership and exporter status, 2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	No oligarch in chain		Distance to oligarch		Foreign in chain		Offshore in chain	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Orange	0.292	0.543	0.134	0.205	0.132	0.520	0.168	0.320
	(0.095)	(0.244)	(0.054)	(0.116)	(0.135)	(0.310)	(0.125)	(0.309)
Gray	0.171	0.267	0.095	0.122	−0.192	−0.045	−0.244	−0.186
	(0.131)	(0.138)	(0.061)	(0.066)	(0.139)	(0.154)	(0.105)	(0.161)
Employment	−0.009	−0.010	−0.004	−0.004	0.034	0.037	0.017	0.018
	(0.015)	(0.016)	(0.009)	(0.009)	(0.023)	(0.022)	(0.020)	(0.020)
TFP	0.015	0.017	0.002	0.003	0.002	0.004	−0.009	−0.008
	(0.018)	(0.017)	(0.010)	(0.011)	(0.019)	(0.018)	(0.018)	(0.017)
Privatized	0.194	0.190	0.109	0.108	−0.018	−0.033	−0.096	−0.102
	(0.081)	(0.089)	(0.039)	(0.039)	(0.087)	(0.090)	(0.091)	(0.092)
Exporter	0.085	0.094	0.025	0.028	0.124	0.133	0.043	0.046
	(0.083)	(0.069)	(0.041)	(0.037)	(0.095)	(0.102)	(0.077)	(0.077)
Sector FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	329	329	329	329	299	299	299	299
First-stage F-stat		9.89		9.89		9.11		9.11
Vote for Yushchenko		0.261		0.099		0.242		0.149
(reduced form)		(0.110)		(0.057)		(0.144)		(0.151)

Notes: Dependent variable is absence of controlling oligarch in ownership chain (columns 1–2), $1 − 1/($steps to oligarch$)$ (columns 3–4; see text for details), presence of foreign entity in ownership chain (columns 5–6), and presence of offshore entity in ownership chain (columns 7–8). The excluded political affiliation is Blue. Province-level vote for Yushchenko in do-over second round of 2004 presidential election instruments Orange in Columns 2, 4, 6 and 8; the effect of Gray is unidentified in these regressions. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at oligarch level.

Table A9: Foreign/offshore owners, 2004, all firms in JSCReg

	(1)	(2)	(3)	(4)	(5)	(6)
	Foreign in chain			Offshore in chain		
Vote for Yushchenko	0.019	0.023	0.032	0.010	0.014	0.019
	(0.062)	(0.055)	(0.037)	(0.031)	(0.028)	(0.024)
Employment			0.049			0.027
			(0.005)			(0.003)
TFP			0.047			0.014
			(0.004)			(0.004)
Privatized			−0.009			0.014
			(0.017)			(0.014)
Industry FEs	No	Yes	Yes	No	Yes	Yes
Observations	7,291	7,291	5,949	7,291	7,291	5,949

Notes: Dependent variable is presence of foreign entity (columns 1–3) and offshore entity (columns 4–6) in ownership chain. Industry fixed effects at two-digit level, with 57 industries represented. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at provincial level.

Table A10: Change in foreign/offshore owners, 2004 to 2006, all firms in JSCReg

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in foreign			Change in offshore		
Vote for Yushchenko	−0.054	−0.047	−0.039	−0.036	−0.025	−0.014
	(0.014)	(0.013)	(0.013)	(0.021)	(0.019)	(0.019)
Employment			0.006			0.008
			(0.003)			(0.003)
TFP			0.002			0.006
			(0.005)			(0.005)
Privatized			−0.013			−0.013
			(0.013)			(0.012)
Industry FEs	No	Yes	Yes	No	Yes	Yes
Observations	6,287	6,287	5,421	6,287	6,287	5,421

Notes: Dependent variable is change in presence of foreign entity (columns 1–3) and offshore entity (columns 4–6) in ownership chain, 2004 to 2006. Industry fixed effects at two-digit level, with 57 industries represented. In parentheses, heteroskedasticity-robust standard errors that correct for correlation of error terms at provincial level.