Online Appendix: Stalin's Terror and the Long-Term Political Effects of Mass Repression

November 28, 2017

Contents

A Data summary

A.1 Breakdown by source

Table 1 lists the total number and percentage of the Memorial's "Victims of Political Terror" data entries from State and Non-State Archives, Memory Books, newspapers and secondary sources.

Table A.1. Memorial arrest records by source

Source	Total	Percent
State archives		
Arhiv Karachaevo-Cherkesskoy Respubliki	730	0.03
Arhivnaya sluzhba Respubliki Ingushetiya	353	0.02
Gos. Arhiv Chuvashskoy Respubliki	5,742	0.25
GUVD Altayskogo kraya	72	0.00
GUVD Chelyabinskoy obl.	8,127	0.35
ITs GUVD Rostovskoy obl.	31,185	1.35
ITs GUVD Tyumenskoy obl.	19,133	0.83
ITs UVD Orenburgskoy obl.	20,525	0.89
Kartoteka Segezhlaga, Kareliya	384	0.02
MVD Buryatii	1,763	0.08
MVD Chuvashskoy Respubliki	6,121	0.27
MVD Kabardino-Balkarii	50,415	2.19
MVD Respubliki Adygeya	1,303	0.06
MVD Respubliki Bashkiriya	58,135	2.52
MVD Respubliki Dagestan	20,282	0.88
MVD Respubliki Hakasiya	207	0.01
MVD Respubliki Ingushetiya	872	0.04
MVD Respubliki Komi	16,204	0.70
MVD Respubliki Mordoviya	4,921	0.21
MVD Respubliki Saha(Yakutiya)	2,252	0.10
MVD Respubliki Tatarstan	46,243	2.01
MVD Respubliki Udmurtiya	13,062	0.57
Svedeniya DKNB RK po Akmolinskoy obl.	4,608	0.20
Svedeniya DKNB RK po Aktyubinskoy obl.	6,353	0.28
Svedeniya DKNB RK po Almatinskoy obl.	768	0.03
Svedeniya DKNB RK po Atyrauskoy obl.	1,934	0.08
Svedeniya DKNB RK po g.Almaty	18,463	0.80
Svedeniya DKNB RK po Karagandinskoy obl.	7,777	0.34
Svedeniya DKNB RK po Kostanayskoy obl.	1,455	0.06
Svedeniya DKNB RK po Kyzylordinskoy obl.	1,034	0.04
Svedeniya DKNB RK po Mangistauskoy obl.	380	0.02
Svedeniya DKNB RK po Pavlodarskoy obl.	3,989	0.17
Svedeniya DKNB RK po Severo-Kazahstanskoy obl.	5,583	0.24
Svedeniya DKNB RK po Vostochno-Kazahstanskoy obl.	13,335	0.58

Svedeniya DKNB RK po Yuzhno-Kazahstanskoy obl.	7,090	0.31
Svedeniya DKNB RK po Zapadno-Kazahstanskoy obl.	5,514	0.24
Svedeniya DKNB RK po Zhambylskoy obl.	3,583	0.16
Svedeniya GUVD Krasnodarskogo kraya	42,387	1.84
Svedeniya KNB RK	5,521	0.24
UVD Amurskoy obl.	3,295	0.14
UVD Belgorodskoy obl.	14,320	0.62
UVD Bryanskoy obl.	2,648	0.11
UVD Chitinskoy obl.	3,221	0.14
UVD Evreyskoy AO	210	0.01
UVD Ivanovskoy obl.	4,479	0.19
UVD Kaliningradskoy obl.	84	0.00
UVD Kaluzhskoy obl.	1,622	0.07
UVD Kirovskoy obl.	737	0.03
UVD Kurganskoy obl.	13,583	0.59
UVD Magadanskoy obl.	4,125	0.18
UVD Murmanskoy obl.	30,839	1.34
UVD Nizhegorodskoy obl.	4,894	0.21
UVD Novgorodskoy obl.	3,427	0.15
UVD Omskoy obl.	19,203	0.83
UVD Orlovskoy obl.	8,281	0.36
UVD Penzenskoy obl.	4,900	0.21
UVD po Ryazanskoy oblasti	8,060	0.35
UVD Smolenskoy obl.	3,601	0.16
UVD Stavropolskogo kraya	17,321	0.75
UVD Sverdlovskoy obl.	1,963	0.09
UVD Tambovskoy obl.	3,668	0.16
UVD Tomskoy obl.	205,322	8.91
UVD Tulskoy obl.	242	0.01
UVD Tverskoy obl.	6,774	0.29
UVD Ulyanovskoy obl.	13,092	0.57
UVD Vologodskoy obl.	6,996	0.30
UVD Voronezhskoy obl.	22,764	0.99
UVD Yaroslavskoy obl.	1,829	0.08
Prokuratura g.Moskvy	19,175	0.83
Prokuratura g. Moskvy	6	0.00
Svedeniya, predostavlennye Pravitelstvom Respubliki Dagestan	4,118	0.18
Non-state archives		
Arhiv NIPTs 'Memorial', Moskva	1,144	0.05
Arhiv NITs 'Memorial' (Sankt-Peterburg)	7,471	0.32
Baza dannyh o zhertvah repressiy Harkovskoy obl. (Ukraina)	1,761	0.08
Baza dannyh o zhertvah repressiy Kamchatskoy obl.	1,905	0.08
Baza dannyh o zhertvah repressiy Primorskogo kraya	10,812	0.47
Baza dannyh 'Polskie spetspereselentsy v Arhangelskoy obl.'	38,455	1.67
Baza dannyh 'Polskie spetspereselentsy v Vologodskoy obl.'	14,437	0.63
Baza dannyh 'Polskie zaklyuchennye vorkutinskih lagerey'	8,047	0.35
Baza dannyh V.A. Shentalinskogo	42	0.00

Baza dannyh V.G.Makarova '1922 god'	46	0.00
D.I.Zubarev	1	0.00
Belorusskiy 'Memorial'	79,849	3.46
Fond 'Shahidlar Hotirasy' (Uzbekistan)	5,944	0.26
Krasnoyarskoe obschestvo 'Memorial'	30,068	1.30
Leningradskiy martirolog: 1937-1938	24,998	1.08
Leningradskiy martirolog: 1937-1938, tom 5	3,151	0.14
Leningradskiy martirolog t.8 (gotovitsya k pechati)	3,669	0.16
Materialy k biograficheskomu slovaryu sotsialistov i anarhistov, 'Memorial' (Moskva)	1,966	0.09
Moskva, rasstrelnye spiski - Butovskiy poligon	22,312	0.97
Moskva, rasstrelnye spiski - Donskoy krematoriy	4,665	0.20
Moskva, rasstrelnye spiski - Kommunarka	4,840	0.21
Moskva, rasstrelnye spiski - Vagankovskoe kladbische	1,038	0.05
Moskva, rasstrelnye spiski - Yauzskaya bolnitsa	93	0.00
NIPTs 'Memorial', Moskva	3,937	0.17
Shirokstroy: spiski kalmykov-voennosluzhaschih, otozvannyh s frontov (1944-1945)	3,207	0.14
Spiski rasstrelyannyh v Moskve	172	0.01
Spiski repressirovannyh v Orenburgskoy obl.	140	0.01
Spiski vyselennyh iz Penzenskoy obl.	4,757	0.21
Tsentr 'Vozvraschennye imena', Nizhniy Tagil	3,046	0.13
'Voronezhskie stalinskie spiski'	583	0.03
Voronezhskoe obschestvo 'Memorial'	6,943	0.30
Penzenskoe obschestvo 'Memorial'	8,409	0.36
Pomorskiy memorial: Kniga pamyati Arhangelskoy obl.	17,487	0.76
Svedeniya Odesskogo akademicheskogo tsentra (Ukraina)	12,387	0.54
MEMORY BOOKS		
Kniga pamyati Alma-Atinskoy obl. (Kazahstan)	2,804	0.12
Kniga pamyati Altayskogo kraya	49,568	2.15
Kniga pamyati Amurskoy obl.	17,285	0.75
Kniga pamyati Astrahanskoy obl.	20,336	0.88
Kniga pamyati Astrahanskoy obl. - materialy k t.4	210	0.01
Kniga pamyati Avtonomnoy Respubliki Krym	22	0.00
Kniga pamyati Belgorodskoy obl.	10,303	0.45
Kniga pamyati Buryatii: podgotovitelnye materialy	3,067	0.13
Kniga pamyati Chelyabinskoy obl. - podgotovitelnye materialy	2,569	0.11
Kniga pamyati Chitinskoy obl.	12,811	0.56
Kniga pamyati g.Mariupolya	418	0.02
Kniga pamyati g.Miass Chelyabinskoy obl.	6	0.00
Kniga pamyati g.Nizhniy Tagil, Sverdlovskaya obl.	677	0.03
Kniga pamyati Habarovskogo kraya	30,233	1.31
Kniga pamyati 'Hranit vechno' (Akmolinskaya obl., Kazahstan)	10,233	0.44
Kniga pamyati Irkutskoy obl.	26,964	1.17
Kniga pamyati Ivanovskoy obl.	13,298	0.58
Kniga pamyati Kabardino-Balkarskoy Respubliki - podgotovitelnye materialy	4,241	0.18

Kniga pamyati Kaliningradskoy obl. - podgotovitelnye materialy	504	0.02
Kniga pamyati Kalininskoy obl.	3,100	0.13
Kniga pamyati Kalininskoy obl. - Podgotovitelnye materialy k 3 tomu.	2,944	0.13
Kniga pamyati Kaluzhskoy obl.	19,968	0.87
Kniga pamyati Kemerovskoy obl.	4,307	0.19
Kniga pamyati Kirovskoy obl.	17,907	0.78
Kniga pamyati Kostromskoy obl. - podgotovitelnye materialy	1,537	0.07
Kniga pamyati Krasnodarskogo kraya	6,863	0.30
Kniga pamyati Krasnoyarskogo kraya	11,500	0.50
Kniga pamyati Kurganskoy obl.	12,280	0.53
Kniga pamyati Kurskoy obl.	7,332	0.32
Kniga pamyati Lipetskoy obl.	18,613	0.81
Kniga pamyati Magadanskoy obl.	7,995	0.35
Kniga pamyati: Martirolog katolicheskoy tserkvi v SSSR. M., 2000	202	0.01
Kniga pamyati Moskovskoy obl.	34,341	1.49
Kniga pamyati Moskovskoy obl., Arhiv NIPTs 'Memorial' (Moskva)	1	0.00
Kniga pamyati Murmanskoy obl.	6,985	0.30
Kniga pamyati Nizhegorodskoy obl.	33,327	1.45
Kniga pamyati Novgorodskoy obl.	57,818	2.51
Kniga pamyati Novosibirskoy obl.	2,681	0.12
Kniga pamyati Omskoy obl.	30,901	1.34
Kniga pamyati Orenburgskoy obl.	7,228	0.31
Kniga pamyati Orlovskoy obl.	13,543	0.59
Kniga pamyati Pavlodarskoy obl. (Kazahstan)	375	0.02
Kniga pamyati Permskoy obl.	36,505	1.58
Kniga pamyati Pskovskoy obl.	31,066	1.35
Kniga pamyati Respubliki Altay	7,871	0.34
Kniga pamyati Respubliki Bashkortostan	43,099	1.87
Kniga pamyati Respubliki Hakasiya	6,223	0.27
Kniga pamyati Respubliki Kareliya	15,136	0.66
Kniga pamyati Respubliki Kirgiziya	7,732	0.34
Kniga pamyati Respubliki Komi	67,515	2.93
Kniga pamyati Respubliki Mariy El	8,288	0.36
Kniga pamyati Respubliki Mordoviya	14,957	0.65
Kniga pamyati Respubliki Saha (Yakutiya)	5,346	0.23
Kniga pamyati Respubliki Severnaya Osetiya - Alaniya.	5,862	0.25
Kniga pamyati Respubliki Tatarstan	47,035	2.04
Kniga pamyati Respubliki Udmurtiya	8,162	0.35
Kniga pamyati Rostovskoy obl.	3,544	0.15
Kniga pamyati Ryazanskoy obl.	5,807	0.25
Kniga pamyati Samarskoy obl.	59,571	2.58
Kniga pamyati Saratovskoy obl. - podgotovitelnye materialy	17,779	0.77
Kniga pamyati Smolenskoy obl.	28,788	1.25
Kniga pamyati ssylki kalmytskogo naroda	23,860	1.03
Kniga pamyati Stavropolskogo kraya	24,403	1.06
Kniga pamyati Sverdlovskoy obl.	14,177	0.61
Kniga pamyati Tambovskoy obl. - podgotovitelnye materialy	8,839	0.38
Kniga pamyati Tomskoy obl.	23,185	1.01

Kniga pamyati Tulskoy obl.	4,142	0.18
Kniga pamyati Tyumenskoy obl.	8,577	0.37
Kniga pamyati Ulyanovskoy obl.	18,004	0.78
Kniga pamyati 'Uznitsy ALZhIRa'	5,954	0.26
Kniga pamyati Vladimirskoy obl.	14,777	0.64
Kniga pamyati Vologodskoy obl. - podgotovitelnye materialy	1,807	0.08
Kniga pamyati Yaroslavskoy obl.	14,308	0.62
SECONDARY SOURCES		
Ashnin F.D., Alpatov B. M. 'Delo slavistov': 30-e gody M., 1994.	48	0.00
Ashnin F.D. i dr. Repressirovannaya tyurkologiya. M., 2002.	11	0.00
Biryukov A.M. Kolymskoe triedinstvo. Posledniy Ryurikovich. Magadan. 2001	1	0.00
Kopelev L.Z. Hranit vechno. M. 1990	1	0.00
Raspyatye. Vyp.1. SPb. 1993	17	0.00
Raspyatye. Vyp.2. SPb. 1994	5	0.00
Raspyatye. Vyp.3. SPb. 1998	9	0.00
Raspyatye. Vyp.4. SPb. 1998	6	0.00
Raspyatye. Vyp.5. SPb. 2000	10	0.00
Rassekrechennyy Zubr. M., 2003, Timofeev-Resovskiy N.V. Vospominaniya. 2000	1	0.00
Repressirovannye geologi. M.-SPB. 1999	358	0.02
Kratkaya evreyskaya entsiklopediya. T7. Raab-Sionisty-sotsialisty. Ierusalim. 1994.	1	0.00
Lev Landau. God v tyurme. // Izvestiya TsK KPSS. 1991. no. 3, SPb. 2006	1	0.00
Lyudi i sudby. Biobibl-skiy slovar vostokovedov-zhertv polit. terrora. SPb. 2003	466	0.02
Markova E.V. Tragicheskaya sudba direktora Mosk-go bib-o inst-a Vyp. 3. M. 1999	1	0.00
Nepravednyy sud. M. 1994	1	0.00
Rokityansky Ya.G Tragicheskaya sudba akademika Ryazanova. Novaya i noveyshaya istoriya, 1992, no. 2, s.107-148 // Istoricheskiy arhiv, 1995, no. 2, s.201-221	2	0.00
Tragicheskie sudby: Repressirovannye uchenye Akademii nauk SSSR. M. 1995	1	0.00
Vozvraschennye imena: Sotrudniki AN Belarusi, Minsk. 1992	37	0.00
NEWSPAPERS		
Gazeta 'Chelyabinskiy rabochiy'	257	0.01
Gazeta 'Moskovskaya pravda'	14,158	0.61

A.2 Breakdown by nationality

Table 2 lists the total and number percentage of arrest records broken down by nationalities.

Table A.2. Arrest records by nationality

Etnicity	Total	Percent
Armenian	2,343	0.10
Belarusian	68,429	2.97
Chechen	1,017	0.04
Chinese	7,896	0.34
Estonian	7,646	0.33
German	46,013	1.99
Greek	1,570	0.07
Jewish	39,761	1.72
Kabardin	5,177	0.22
Kalmyk	8,659	0.38
Korean	4,587	0.20
Latvian	13,482	0.58
Lithuanian	3,302	0.14
Ossetian	2,911	0.13
Polish	80,837	3.50
Russian	555,384	24.07
Tatar	27,084	1.17
Ukrainian	52,897	2.29
Unknown/Other	1,378,657	59.74

A.3 Breakdown by occupation

Table 3 lists the total number and percentage of arrest records broken down by occupation type.

Table A.3. Arrest records by professional occupation

Occupation	Total	Percent
Farming	320,160	13.40
Forestry	26,791	1.12
Industry	36,147	1.51
Management	220,673	9.23
Retired	3,903	0.16
Services	28,934	1.21
Unemployed	2,772	0.12
Unknown/Other	1,750,450	73.25

A.4 Breakdown by region

Table 4 lists the total number and percentage of arrest records broken down by region.

Table A.4. Arrest records by region

Oblast/Kray/Republic	Total	Percent
Adygey	301	0.03
Altay	33,773	3.65
Amur	9,832	1.06
Arkhangel'sk	6,785	0.73
Astrakhan'	11,622	1.25
Bashkortostan	43,508	4.70
Belgorod	5,756	0.62
Bryansk	10,507	1.13
Buryat	3,919	0.42
Chechnya	952	0.10
Chelyabinsk	4,147	0.45
Chukot	940	0.10
Chuvash	5,209	0.56
City of St. Petersburg	13,652	1.47
Dagestan	6,763	0.73
Gorno-Altay	948	0.10
Ingush	396	0.04
Irkutsk	9,899	1.07
Ivanovo	8,760	0.95
Kabardin-Balkar	29,569	3.19
Kaliningrad	1,679	0.18
Kalmyk	5,430	0.59
Kaluga	15,585	1.68
Kamchatka	1,315	0.14
Karachay-Cherkess	270	0.03
Karelia	5,720	0.62
Kemerovo	5,258	0.57
Khabarovsk	5,586	0.60
Khakass	3,474	0.38
Khanty-Mansiy	787	0.08
Kirov	8,329	0.90
Komi	29,338	3.17
Kostroma	1,665	0.18
Krasnodar	9,881	1.07
Krasnoyarsk	14,852	1.60
Kurgan	15,227	1.64
Kursk	10,280	1.11
Leningrad	9,977	1.08
Lipetsk	10,000	1.08
Maga Buryatdan	250	0.03
Mariy-El	4,515	0.49
Mordovia	15,273	1.65

Moscow City	32,691	3.53
Moskva	36,626	3.95
Murmansk	5,517	0.60
Nenets	194	0.02
Nizhegorod	16,541	1.79
North Ossetia	1,716	0.19
Novgorod	32,295	3.49
Novosibirsk	9,515	1.03
Omsk	15,051	1.62
Orel	13,384	1.44
Orenburg	15,620	1.69
Penza	12,510	1.35
Perm'	24,987	2.70
Primor'ye	5,110	0.55
Pskov	14,889	1.61
Rostov	8,468	0.91
Ryazan'	8,970	0.97
Sakha	4,125	0.45
Sakhalin	518	0.06
Samara	27,193	2.94
Saratov	9,716	1.05
Smolensk	12,059	1.30
Stavropol'	9,517	1.03
Sverdlovsk	9,280	1.00
Tambov	16,685	1.80
Tatarstan	61,663	6.66
Tomsk	9,446	1.02
Tula	3,665	0.40
Tuva	636	0.07
Tver'	7,195	0.78
Tyumen'	5,589	0.60
Udmurt	13,758	1.49
Ul'yanovsk	21,578	2.33
Vladimir	7,455	0.80
Volgograd	9,890	1.07
Vologda	10,971	1.18
Voronezh	27,905	3.01
Yamal-Nenets	634	0.07
Yaroslavl'	10,654	1.15
Yevrey	2,031	0.22
Zabaykal'ye	8,173	0.88

B Instrumental variable

B.1 Impact of railroads on sentencing

Might railroads have affected the supply of local prisoners by influencing the sentencing process? To answer this question, we estimated several quasi-binomial models of the form

$$\frac{\text{Sentenced to Gulag}_{ij}}{\text{Total}_{ij}} = g^{-1}(\text{Rail}_i\alpha + X_{ij}\beta + u_j + \epsilon_{ij})$$

where $\frac{\text{Sentenced to Gulag}_{ij}}{\text{Total}_{ij}}$ represents Gulag imprisonment as a proportion of political sentences in location i in oblast j, Rail_i is the distance from i to the nearest railroad, X_{ij} is a set of local covariates including urbanization and terrain, u_j are oblast fixed effects, and $g^{-1}()$ is a quasi-binomial link. Units of analysis here are localities (indexed $i \in \{1, \ldots, N\}$) within oblasts (indexed $j \in \{1, \ldots, J\}$).

The results, in Table B.1, suggest that the proportion of political arrestees sentenced to the Gulag – as opposed to other punishment, like local incarceration, confiscation of property and execution – was indeed higher in logistically-accessible areas (Models 1, 3). The proportion of arrestees sentenced to death by local firing squad, meanwhile, was consistently lower in such areas (Models 4-6). Where transporting prisoners was relatively inexpensive and efficient, the data suggest, those prisoners were more likely to live long enough to see the inside of a Gulag cell.

Table B.1. Railroad access made execution of political prisoners less likely. Values shown are standardized quasi-Poisson regression coefficients. 95% CI in parentheses.

	Dependent variable: Sentenced to Gulag			*Dependent variable:* Sentenced to death		
	(1)	(2)	(3)	(4)	(5)	(6)
Dist. to nearest rail station	-0.07^{*} $(-0.12, -0.02)$			0.16^{**} $(0.06, 0.26)$		
Dist. to nearest rail line		-0.04 $(-0.08, 0.01)$			0.20^{***} $(0.11, 0.29)$	
Dist. to nearest Gulag			-0.06^{*} $(-0.11, -0.01)$			0.09^{*} $(0.01, 0.18)$
SD(Elevation)	-0.02 $(-0.07, 0.03)$	-0.01 $(-0.06, 0.03)$	-0.02 $(-0.07, 0.03)$	0.02 $(-0.07, 0.12)$	0.01 $(-0.09, 0.10)$	0.02 $(-0.07, 0.11)$
Urbanization (1926)	0.09^{***} $(0.04, 0.13)$	0.09^{***} $(0.05, 0.13)$	0.09^{***} $(0.05, 0.13)$	-0.18^{***} $(-0.27, -0.09)$	-0.19^{***} $(-0.27, -0.10)$	-0.18^{***} $(-0.27, -0.09)$
Region FE	Y	Y	Y	Y	Y	Y
Observations	6,502	6,502	6,502	6,502	6,502	6,502
qAIC	4616	4606	4618	4785	4868	4754
Note:						*p<0.05; **p<0.01; ***p<0.001

B.2 Exogeneity of railroad construction to repression

Did railroads drive Soviet repression, or did repression drive the development of Soviet railroads? To find the determinants of rail construction in Soviet times, we constructed an empirical model of network expansion in 1917-1953, using historical data from the Russian Ministry of Railroads (Afonina, 1996).

$$\text{Rail}_{ijt} = g^{-1}(\text{Gulag}_{ijt\pm\Delta t}\alpha + X_{ijt}\beta + \text{Dist. to Rail}_{ijt-1}\gamma + u_j + v_t + \epsilon_{ijt}) \tag{B.1}$$

where Rail_{ijt} is the number of new rail stations built in locality i, oblast j in year t, and $\text{Gulag}_{ijt\pm\Delta t}$ is the number of pre-existing ($t \pm \Delta t = t-1$), new ($t \pm \Delta t = t$) or planned ($t \pm \Delta t = t+5$) Gulags in the same location. Dist. to Rail_{ijt-1} is the distance from i, j to the nearest rail station at $t-1$, and X_{ijt} is a vector of local covariates, including urbanization (from 1926 Soviet census), total population, and local variance in elevation. $g^{-1}()$ is an inverse quasi-Poisson link, and u_j, v_t are oblast and yearly fixed effects. The unit of analysis here is locality-year, with repeated yearly observations for locality $i \in \{1, \ldots, N\}$ in oblast $j \in \{1, \ldots, J\}$, over the years 1917-1953 (indexed $t \in \{1, \ldots, T\}$.

The results, in Table B.2, suggest that the locations of Gulags had no discernible impact on railroad construction. In no model is the coefficient on the Gulag variable statistically significant – neither the previous existence of Gulags in a locality, nor the construction of new ones, or even their planned construction (within the next five years) had an impact on the likelihood of new railroad construction. Instead, Soviet-era railroad construction prioritized locations that were relatively urbanized, and easy to reach (i.e. located on flat terrain, near existing rail stations and lines).

Table B.2. Gulag locations did not drive Soviet railroad construction. Values shown are percentage changes in the probability of Soviet railroad network expansion to location i during year t, following a standard deviation increase in each variable. 95% confidence intervals in parentheses.

	Dependent variable: Expansion of railroad network to locality i at time t					
	(1)	(2)	(3)	(4)	(5)	(6)
Gulags (existing)	0.56	0.53				
	(−1.53, 2.64)	(−1.55, 2.62)				
Gulags (new)			0.56	0.53		
			(−1.53, 2.64)	(−1.55, 2.62)		
Gulags (planned)					0.53	0.51
					(−0.99, 2.05)	(−1.01, 2.03)
Population size (1926)	1.67		1.67		1.67	
	(−0.68, 4.02)		(−0.68, 4.02)		(−0.69, 4.03)	
Urbanization (1926)		2.41**		2.41**		2.41**
		(0.65, 4.18)		(0.65, 4.18)		(0.64, 4.18)
SD(Elevation)	−3.54***	−3.48***	−3.54***	−3.48***	−3.54***	−3.48***
	(−4.78, −2.31)	(−4.71, −2.25)	(−4.78, −2.31)	(−4.71, −2.25)	(−4.77, −2.31)	(−4.71, −2.24)
Dist. to nearest rail station	−9.43***	−9.45***	−9.43***	−9.45***	−9.43***	−9.45***
	(−11.31, −7.55)	(−11.33, −7.57)	(−11.31, −7.55)	(−11.33, −7.57)	(−11.31, −7.54)	(−11.33, −7.56)
Region FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	60,112	60,112	60,112	60,112	60,112	60,112
qAIC	26,198	26,195	26,195	26,195	26,195	26,195

Note: *p<0.05; **p<0.01; ***p<0.001

B.3 Determinants of Gulag construction, 1924-1953

Did the Soviets build Gulags in close proximity to potential sources of forced labor? To answer this question, we fit a simple model of Gulag construction (1924-1953),

$$\text{Gulag}_{ijt} = g^{-1}(\text{Dist. to rail}_{ijt-1}\alpha + X_{ijt}\beta + \text{Gulag}_{ijt-1}\gamma + u_j + v_t + \epsilon_{ijt}) \tag{B.2}$$

where Gulag_{ijt} is the number of new Gulags built in locality i, oblast j in year t, Dist. to rail_{ijt-1} is the distance from i, j to the nearest rail station at $t-1$, and X_{ijt} is a vector of local covariates, including urbanization (from 1926 Soviet census), and local variance in elevation. $g^{-1}()$ is an inverse quasi-Poisson link, and u_j, v_t are oblast and yearly fixed effects. The unit of analysis here is locality-year, with repeated yearly observations for locality $i \in \{1, \ldots, N\}$ in oblast $j \in \{1, \ldots, J\}$, over the years 1917-1953 (indexed $t \in \{1, \ldots, T\}$.

The results, in Table B.3, suggest that the Soviets tended to build Gulags mostly in rural areas, away from major cities. A standard deviation increase in early Soviet urbanization tended to decrease the probability of new Gulag construction in a given year by 11 percent, on average (95% confidence interval: -16.69, -5.16).

The data also suggest that, rather than disperse the Gulags across the country, Soviet authorities built them in clusters – with new prison camps typically appearing in close proximity to existing camps, where requisite infrastructure was already in place. Railroads were an essential piece of this infrastructure – all else equal, a standard deviation increase in distance from the railroad reduced the probability of new Gulag construction by up to 80 percent (95% CI: -97.02, -63.60). While – as we saw in Table B.2 – Gulags did not drive railroad expansion, the railroads themselves appear to have been instrumental to the growth of the Gulag system.

Table B.3. Gulags were more likely in railroad-accessible, rural areas. Values shown are percentage changes in the probability of a new Gulag being built in location i during year t, following a standard deviation increase in each variable. 95% confidence intervals in parentheses.

	Dependent variable: New Gulag in locality i at time t	
	(1)	(2)
Urbanization (1926)	-10.34^{***}	-10.92^{***}
	(-16.27, -4.40)	(-16.69, -5.16)
SD(Elevation)	-8.99^{**}	-4.87
	(-15.41, -2.58)	(-13.66, 3.92)
Dist. to nearest rail station (existing)	-65.35^{***}	-80.31^{***}
	(-74.20, -56.50)	(-97.02, -63.60)
Gulags (existing)	17.43^{***}	25.02^{***}
	(17.08, 17.78)	(24.43, 25.61)
Region FE	N	Y
Year FE	Y	Y
Observations	56,672	56,672
qAIC	15672	17153
Note:		*p<0.05; **p<0.01; ***p<0.001

B.4 Soviet railroads and post-Soviet economic performance, 2000-2012

Could Soviet-era railroad access have affected post-Soviet elections by shaping local economic performance? It is possible that turnout in rail-accessible areas is lower not due to repression, but because these areas saw disproportionate economic decline after the Soviet collapse – after Soviet factory towns lost the state subsidies and protections they had previously enjoyed. To account for this possibility, we estimated two sets of models of post-Soviet regional economic performance,

$$\ln(\text{GRP})_{ijt} = \text{Rail}_i\alpha + X_{ijt}\beta + \ln(\text{GRP})_{ijt-1}\gamma + u_j + v_t + \epsilon_{ijt} \tag{B.3}$$

$$\ln(\text{Unemployment})_{ijt} = \text{Rail}_i\alpha + X_{ijt}\beta + \ln(\text{Unemployment})_{ijt-1}\gamma + u_j + v_t + \epsilon_{ijt} \tag{B.4}$$

where $\log(\text{GRP})_{ijt}$ and $\log(\text{Unemployment})_{ijt}$ are the logged gross regional product and unemployment rate, respectively. Rail_i is the distance from i to the nearest rail station in 1945, X_{ijt} is a matrix of covariates, including early urbanization (1926), and u_j, v_t are fixed effects.

The unit of analysis is a locality-year, where localities (indexed $i \in \{1, \ldots, N\}$) are nested within oblasts ($j \in \{1, \ldots, J\}$), and observed over multiple years from 2003 to 2012 ($t \in \{1, \ldots, T\}$).

Table B.4 reports estimates from these models, which show no evidence that Soviet-era rail access caused local economic declince in the Putin era. Models 1, 3, 5 and 7 show that gross regional product tends to be higher, and unemployment lower, in localities closer to the railroad. These estimates become insignificant once we account for regional fixed effects (Models 2, 4, 6, 8), but in no model is worse economic performance associated with greater railroad access.

To the extent that railroad access affects post-Soviet politics through an economic pathway, the data suggest that Soviet-era railroads either had no effect or actually made some localities more resilient against post-Soviet economic decline. This relatively strong economic performance and employment in rail-accessible localities should therefore lead us to expect either higher voter turnout in these areas, or no difference at all (Colton & Hale, 2009; Konitzer-Smirnov, 2003; Panov & Ross, 2013; Treisman, 2011). Neither of these scenarios is likely to bias our results in favor of finding a negative repression effect.

Table B.4. Railroad-accesible areas are not less economically-prosperous today. Values shown are standardized regression coefficients. 95% CI in parentheses.

	Dependent variable: Gross regional product				*Dependent variable:* Unemployment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dist. to nearest rail station	-0.01^{***} (-0.01, -0.01)	0.00 (-0.001, 0.001)			0.01^{***} (0.004, 0.01)	-0.00 (-0.005, 0.005)		
Dist. to nearest rail line			-0.01^{***} (-0.01, -0.01)	0.00 (-0.001, 0.001)			0.01^{***} (0.004, 0.01)	-0.00 (-0.005, 0.005)
GRP (t-1)	0.98^{***} (0.98, 0.98)	0.26^{***} (0.25, 0.26)	0.98^{***} (0.98, 0.98)	0.26^{***} (0.25, 0.26)				
Unemployment rate (t-1)					0.84^{***} (0.83, 0.84)	0.40^{***} (0.40, 0.41)	0.84^{***} (0.83, 0.84)	0.40^{***} (0.40, 0.41)
Urbanization (1926 census)	0.003^{***} (0.002, 0.004)	-0.00 (-0.001, 0.001)	0.003^{***} (0.002, 0.004)	-0.00 (-0.001, 0.001)	-0.02^{***} (-0.02, -0.01)	0.00 (-0.003, 0.003)	-0.02^{***} (-0.02, -0.01)	0.00 (-0.003, 0.003)
Region FE	N	Y	N	Y	N	Y	N	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	110,011	110,011	110,011	110,011	110,011	110,011	110,011	110,011
Log Likelihood	88,871	121,872	88,868	121,872	$-71,176$	$-48,558$	$-71,174$	$-48,558$
Akaike Inf. Crit.	$-177,725$	$-243,574$	$-177,721$	$-243,574$	142,369	97,285	142,365	97,285

Note: *p<0.05; **p<0.01; ***p<0.001

B.5 Railroads and Soviet internal migration

Could Soviet-era railroad access have affected post-Soviet elections by facilitating internal migration? Because railroads made it easier for people to leave, one may wonder if those who witnessed Soviet repression were more likely to migrate, and whether their descendants – in communities of destination – were subsequently more likely to turn out. If true, then a negative effect of repression on voting (instrumented by railroads) may simply reflect the displacement of more politically-active citizens to less-heavily repressed areas. While such a dynamic is not necessarily inconsistent with our expectation that repression deters local political participation, it is nevertheless problematic for inference. To explore this possibility, we estimated a simple model of Soviet-era migration, combining our data on Stalin-era repression and railroads with data on inter-regional migration from the final Soviet census of 1989 (**?**). Formally,

$$\ln(\text{Migration})_{od} = \text{Rail}_{od}\alpha + X_{od}\beta + u_d + \epsilon_{od} \tag{B.5}$$

where $\ln(\text{Migration})_{od}$ is the logged migration flow from origin oblast o to destination oblast d, and Rail_{od} is the difference between d and o in logged distance to nearest railroad, with higher values indicating that o is closer to the railroad than d. X_{od} is a matrix of dyadic covariates, including the difference between d and o in logged number of local residents sent to the Gulag (higher values indicate that o experienced more repression than d), and the difference between d and o in 1926-era urbanization (higher values indicate that o was more urbanized than d). u_d are fixed effects.

Units of analysis here are dyadic pairs, in which one Russian oblast is a birth location (origin, o) and the second oblast is a place of residence in 1989 (destination, d). For example, if $\text{Migration}_{od} = 100$ for $o = \text{Moscow}, d = \text{Leningrad}$, then a net of 100 people who were born in Moscow resided in Leningrad at the time of the 1989 census. If $\text{Migration}_{od} = -100$, then 100 people moved in the opposite direction, from Leningrad to Moscow.

According to the 1989 census, 24 percent of the population of the RSFSR (37 million) was born outside of the region in which they resided at the time. As Table B.5 reports, the same logistical factors that drove Soviet repression (rail access) also facilitated a more general movement of people away from these localities. The coefficient on the railroad variable is negative, which suggests that migrants' locations of birth tended to be more accessible by railroad than their destinations. While migration patterns also followed a general rural-to-urban trajectory, top destinations also included many remote areas in the far east and north, away from territories occupied by the Germans in WWII. For example, regions with over 50% non-native born population included Chukotka, Kamchatka, Khanty-Mansiy, Maga Buryatdan, Murmansk, Sakhalin, Yamal-Nenets, and Birobidzhan.

The negative coefficient on repression in Table B.5 also indicates population movement away from more heavily-repressed areas, to less-heavily repressed areas. In estimating the effect of repression on migration, however, oblast-level migration statistics may be misleading. About a third of the 37 million internal Soviet migrants (or 12 million) were displaced as a result of Stalin-era forcible resettlement, deportation, and labor force transfers (**?**). At this level of aggregation, we cannot distinguish those forcibly displaced from other types of migrants in the census data. The 1989 census, moreover, undercounts people who had moved multiple times prior to 1989. If an individual had been displaced as a result of government repression, and later moved back to their place of birth, the 1989 census would record that individual as never having left. These two sources of bias push in opposite directions – the first likely causing the models in Table B.5 to overestimate the impact of repression, and the second to underestimate it. In any case, we are unable to conclude from Table B.5 whether people moved away from some localities due to Stalin-era repression, or because both repression and out-migration share a common cause (i.e. railroads).

The highly-regulated nature of Soviet internal migration policy makes the second of these in-

terpretations more empirically plausible. In the USSR, there were multiple institutions in place to prevent voluntary migration. Since 1932, Soviet citizens were bound to "permanent places of residence" through internal passports and propiski (residency permits issued on a limited basis by local police). Individuals were forbidden from seeking housing, employment and education where they had no such permit, under penalty of a fine and up to two years in prison. The criminalization of internal migration constrained people's options, unless they had the express permission of state authorities. Here, former political prisoners and their families faced especially heavy restrictions.

Table B.5. Soviet citizens moved from more to less-repressive areas. Values shown are standardized regression coefficients. 95% CI in parentheses.

	Dependent variable: migration flow from origin to destination		
		NA	
	(1)	(2)	(3)
Dist. to nearest rail station (destination-origin difference)	0.349*** (0.322, 0.377)	0.331*** (0.303, 0.359)	0.306*** (0.279, 0.334)
Urbanization (1926) (destination-origin difference)	0.249*** (0.221, 0.277)	0.234*** (0.206, 0.262)	0.237*** (0.210, 0.264)
Stalin-era repression (destination-origin difference)		−0.127*** (−0.155, −0.099)	−0.095*** (−0.122, −0.067)
Dist. to WWII occupation (destination-origin difference)			0.231*** (0.203, 0.258)
Region FE	Y	Y	Y
Observations	6,152	6,152	6,152
Log Likelihood	−7,160.420	−7,120.955	−6,986.052
Akaike Inf. Crit.	14,482.840	14,405.910	14,138.100
Note:			*p<0.05; **p<0.01; ***p<0.001

How did Soviet-era migration influence subsequent voting? Across all elections 2003-2012, regions with above-average non-native born populations turned out to vote as the same rate as those below the average (68.1 vs. 68.4). If we compare only the top and bottom deciles, however, the 10% of Russian regions with the highest non-native born population had an average turnout rate of 66 percent, while the bottom 10% turned out a rate of 72 percent. The difference in means was marginally significant, at $p = .06$.

The preponderance of evidence leads us to conclude that – if railroads do affect elections through migration – this effect runs counter to what we would expect if railroads simply allowed witnesses of repression to vote in higher numbers somewhere else. Even if some Soviet citizens were able to migrate away from repression, the lower turnout in migrant-receiving communities suggests that migrants' descendents are likely less, not more politically active today.

C Main results

C.1 Additional covariates

In the main text, Table 2 reports instrumental variable results for the core model specification. Here, we include several additional pre-treatment or contemporaneous covariates to the right hand side, including urbanization (from 1926 Soviet census), distance to German-occupied territory in WWII, and local variation in elevation.

Table C.1 reports second-stage estimates of the repression effect on turnout, for the 2012 presidential elections. Table C.2 reports first-stage estimates.

Table C.1. Second-stage instrumental variable coefficients (2012 Russian elections)

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	Dependent variable:					
	Turnout (2012)					
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment, instrumented:						
log(Repression)	-0.70^{***} (-1.03, -0.37)	-0.67^{***} (-1.00, -0.33)	-0.44 (-1.00, 0.12)	-0.31^{***} (-0.47, -0.15)	-0.30^{***} (-0.47, -0.14)	-0.26^{**} (-0.43, -0.10)
Covariates:						
Dist. to WWII occupation	-0.01 (-0.06, 0.05)	-0.003 (-0.06, 0.05)	0.02 (-0.05, 0.09)	0.23^{**} (0.07, 0.40)	0.23^{**} (0.07, 0.40)	0.24^{**} (0.07, 0.41)
SD(Elevation)	0.01 (-0.03, 0.04)	0.01 (-0.03, 0.04)	-0.003 (-0.04, 0.03)	-0.08 (-0.20, 0.04)	-0.08 (-0.20, 0.04)	-0.08 (-0.20, 0.04)
Urbanization (1926)	-0.06^{***} (-0.09, -0.03)	-0.06^{***} (-0.09, -0.03)	-0.06^{***} (-0.08, -0.03)	0.001 (-0.06, 0.06)	0.001 (-0.06, 0.06)	0.001 (-0.06, 0.06)
Oblast FE	Y	Y	Y	Y	Y	Y
Moran eigenvectors	N	N	N	Y	Y	Y
Weak instruments	44.16***	41.15***	11.77***	11.31***	10.19***	9.29***
Wu-Hausman	25.17***	21.35***	2.52	3.67′	3.37′	1.15
Moran's I (resid)	26.66***	26.79***	27.74***	-3.96	-3.97	-3.99
Observations	5,490	5,490	5,490	351	351	351
R^2	0.24	0.27	0.41	0.72	0.72	0.72
Adjusted R^2	0.23	0.25	0.40	0.63	0.63	0.63
Residual Std. Error	0.80 (df = 5404)	0.78 (df = 5404)	0.70 (df = 5404)	0.58 (df = 263)	0.58 (df = 263)	0.58 (df = 263)

Note: *p<0.1; **p<0.05; ***p<0.01

Table C.2. First-stage instrumental variable coefficients (2012 Russian elections)

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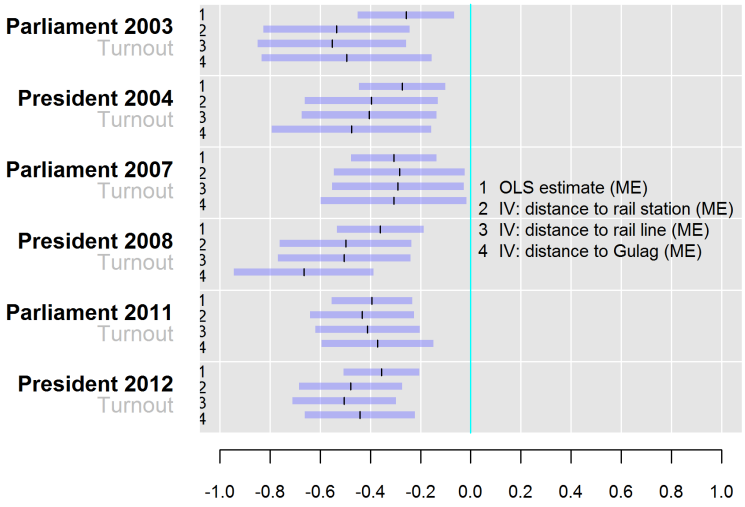
	Dependent variable:					
	log(Repression)					
	(1)	(2)	(3)	(4)	(5)	(6)
Instrumental variables:						
Distance to station	−0.56*** (−0.73, −0.40)			−0.59*** (−0.79, −0.40)		
Distance to railroad		−0.54*** (−0.71, −0.38)			−0.59*** (−0.78, −0.39)	
Distance to Gulag			−0.09*** (−0.14, −0.04)			−0.10′ (−0.20, 0.01)
Covariates:						
Dist. to WWII occupation	−0.10*** (−0.14, −0.07)	−0.11*** (−0.14, −0.07)	−0.11*** (−0.15, −0.07)	−0.07 (−0.23, 0.09)	−0.07 (−0.23, 0.09)	−0.15′ (−0.32, 0.01)
SD(Elevation)	0.03* (0.002, 0.06)	0.03* (0.004, 0.06)	0.03* (0.01, 0.06)	−0.08 (−0.19, 0.04)	−0.07 (−0.19, 0.04)	−0.04 (−0.16, 0.08)
Urbanization (1926)	−0.01 (−0.04, 0.01)	−0.01 (−0.04, 0.01)	−0.01 (−0.04, 0.01)	−0.01 (−0.07, 0.05)	−0.01 (−0.07, 0.05)	−0.002 (−0.06, 0.06)
Observations	5,490	5,490	5,490	351	351	351
Log Likelihood	−5,892.01	−5,893.53	−5,908.38	−254.95	−255.57	−274.06
Akaike Inf. Crit.	11,956.02	11,959.06	11,988.76	633.91	635.13	672.12
Note:						*p<0.1; **p<0.05; ***p<0.01

C.2 Moran Eigenvector specification

The Moran eigenvector method diagonalizes the $N \times N$ connectivity matrix $\mathbf{C}$ (where $c_{ij} = 1$ if localities i and j share a border, and 0 otherwise) to select the set of m eigenvectors with the largest achievable Moran's I coefficient of spatial autocorrelation. To eliminate potential multicollinearity, the algorithm extracts the eigenfunctions of the matrix $[\mathbf{I} - \mathbf{X}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}']\mathbf{C}[\mathbf{I} - \mathbf{X}(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}']$, where $\mathbf{X} = [\iota_n \; X \; L]$ is the $N \times (k+1)$ matrix of covariates. After extracting the matrix of eigenvectors, $\mathbf{v}_{ij}$, we include it in the model specification as an additional set of covariates.

Figure C.1 shows the second-stage estimates of the repression effect on voting, using the Moran eigenvector approach.

Figure C.1. Effect estimates of Soviet repression on contemporary voting, Moran Eigenvectors.



D Alternative explanations of political participation

Stalin's terror is neither the sole nor principal driver of voter turnout in contemporary Russia. In the current section, we consider several alternative explanations, including urban-rural differences, ethnic differences and economic performance. As we show, the repression effect remains strong after we account for these potential confounders.

D.1 Urban-rural differences

Because there were more arrests in densely populated areas – where potential targets for repression were in greater supply – the negative relationship between terror and political participation could simply reflect lower voter turnout in urban areas. Historical evidence is mixed on this point. Voter turnout is indeed higher in the Russian countryside (**??**), and the persistence of urban-rural divide remains a determining factor in Russian electoral outcomes (Clem & Craumer, 1997; Gehlbach, 2000; McFaul, 1997). Yet the Soviet legacy is also more ambiguous in Russia's urban areas. Soviet economic policy, particularly under Stalin, favored urban industrial development at the expense of the countryside. The human costs of collectivization, extraction of agriculture, famine and dekulakization disproportionately affected rural areas. If industrializing cities were among the beneficiaries of the Soviet experiment, then this experience should offset rather than compound the negative effect of repression.

To check whether Soviet-era repression continues to affect voting after we adjust for population density, we included pre-treatment urbanization (from the 1926 Soviet census) as a covariate in our main regression models. Tables C.1-C.2 report these results in full.

In addition to pre-treatment urbanization, we also re-estimated our turnout models with modern population density as a covariate in X_i. If the repression effect attenuates significantly after this post-treatment adjustment, we can conclude that urban-rural differences are a plausible alternative explanation of our results. To this end, we use data on local population density in the year 2000 – which are temporally prior to the 2003-2012 election cycles, but obviously not prior to Soviet repression.

The results, which we report in Table D.1, show that the direction, strength and significance of the resettlement coefficient remains the same: instrumented by distance to the nearest rail station, a standard deviation increase in repression yields a .74 standard deviation decrease in voter turnout. Net of repression, meanwhile, population density has no discernible impact on turnout.

Table D.1. Urban-rural differences do not drive voter turnout.

Second stage results	*Dependent variable:*					
	Turnout (2012)					
	(1)	(2)	(3)	(4)	(5)	(6)
log(Repression)	-0.74^{***}	-0.64^{***}	-0.57^{*}	-0.27^{**}	-0.33^{***}	-0.23^{**}
	(−1.04, −0.43)	(−0.93, −0.35)	(−1.03, −0.11)	(−0.44, −0.10)	(−0.50, −0.16)	(−0.41, −0.06)
Population density	0.01	0.01	0.001	−0.01	−0.01	−0.03
	(−0.01, 0.04)	(−0.02, 0.03)	(−0.04, 0.04)	(−0.13, 0.12)	(−0.14, 0.11)	(−0.16, 0.09)
First stage results	*Dependent variable:*					
	log(Repression)					
Distance to station	-0.66^{***}			-0.63^{***}		
	(−0.83, −0.49)			(−0.83, −0.44)		
Distance to railroad		-0.65^{***}			-0.62^{***}	
		(−0.82, −0.48)			(−0.82, −0.43)	
Distance to Gulag			-0.11^{***}			-0.10^{*}
			(−0.15, −0.06)			(−0.20, −0.01)
Population density	0.08^{***}	0.08^{***}	0.08^{***}	0.18^{**}	0.18^{**}	0.19^{**}
	(0.07, 0.09)	(0.07, 0.09)	(0.07, 0.09)	(0.06, 0.30)	(0.06, 0.30)	(0.07, 0.32)
Oblast FE	Y	Y	Y	Y	Y	Y
Observations	7,026	7,026	7,026	391	391	391
R^2	0.23	0.30	0.35	0.71	0.70	0.70
Adjusted R^2	0.22	0.29	0.34	0.63	0.62	0.63
Residual Std. Error	0.83 (df = 6941)	0.79 (df = 6941)	0.76 (df = 6941)	0.58 (df = 310)	0.59 (df = 311)	0.58 (df = 311)
Weak instruments	56.5^{***}	54.55^{***}	20.55^{***}	12.93^{***}	12.6^{***}	8.95^{***}
Wu-Hausman	37.78^{***}	27.34^{***}	8.13^{**}	1.37	4.11^{*}	0.39
Moran's I (resid)	32.22^{***}	32.78^{***}	33.17^{***}	-3.25	-3.19	-3.23

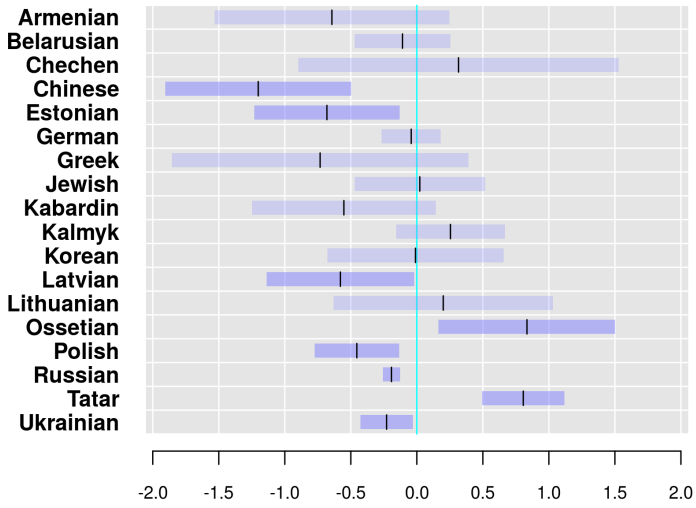
Note: Standardized coefficients and 95% confidence intervals reported.
$^{'}$p<0.1; *p<0.05; **p<0.01; ***p<0.001

D.2 Repressed minorities

A second alternative explanation is that the negative effect of repression may be driven by Stalin's mass resettlements of ethnic minorities, and it is backlash from ethnic cleansing, rather than political repression in general, that explains the effect. An extreme example of this phenomenon is Stalin's total deportation of Chechens to Central Asia in 1944. Dzhokhar Dudayev, who led Chechnya's separatist insurgency in 1994-1996, spent the first years of his life in a resettlement colony in Kazakhstan, and the deportation experience still casts a shadow over Chechnya's now-peaceful relations with Moscow. Chechens' experience was not unique. Leaders of the Crimean Tatar community, whose ancestors shared a similar fate under Stalin, urged a boycott of the 2016 Russian parliamentary elections.

Although anecdotal evidence suggests that the negative electoral consequences of repression should be most acute in ethnic minority areas, the data tell a different story. Localities where non-Russian minorities represented a bigger share of arrestees are neither more nor less likely to vote today. Figure D.1 reports coefficients from a regression of turnout on the proportion of arrestees who belonged to each of 18 ethnic groups most heavily victimized by Stalin's terror.[1] The figure shows no consistent relationship between the ethnicity of the repressed and contemporary political participation. For most ethnic groups, the standardized coefficient on repression was statistically insignificant. For some groups – like Russians, Estonians and Poles – voter turnout was lower following repression. Yet for territorially concentrated minorities – like Ossetians and Tatars – the relationship was positive.

Figure D.1. Differential responses to repression across ethnic groups. Quantities reported are standardized coefficient estimates from regressions of voter turnout in 2012 on the proportion of repressed by ethnic group, with oblast fixed effects (18 separate models).



[1] These include Armenians, Belarusians, Chechens, Chinese, Estonians, Germans, Greeks, Jews, Kabardins, Kalmyks, Koreans, Latvians, Lithuanians, Ossetians, Poles, Russians, Tatars, and Ukrainians.

D.3 Economic conditions

If perceptions of economic performance are indeed "the single most influential variable" in Russia's contemporary electoral outcomes – as past research suggests (Rose, 2007; Colton & Hale, 2009; Rose, 2007; White & Mcallister, 2008; Treisman, 2011) – then its omission from our models could bias estimates of the repression effect. Yet since past repression may have affected contemporary economic performance, controlling for this potential confounder presents a trade-off between omitted variable bias and post-treatment bias. This is a trade-off without a straightforward statistical solution, since the current application presents us neither with identifying information, nor options to redesign data collection to avoid the problem.

To account for the impact of economic performance on voting, we proceed in two steps. First, we examine the relationship between repression and contemporary economic performance in Russian regions. Because our economic data are at the level of the oblast-year, we aggregate our repression data to total number of individuals resettled to camps from each oblast. We then regress oblast-year economic indicators – unemployment rates, gross regional product (GRP) – on this aggregate measure of repression, along with fixed effects. We find no evidence of a relationship between Soviet-era repression and post-Soviet economic performance. In these results, which we report in the Table D.2, the coefficient estimate on repression is effectively zero.

In the second step of our analysis, we directly control for the confounding influence of economic performance on voter turnout. To exploit variation in the economic variables over time, we pooled all election results from 2003 to 2014, and created a panel dataset at the level of a grid cell-year. We then regressed turnout on Soviet-era repression, while controlling for the unemployment rate (alternatively, GRP) and fixed effects at the oblast and yearly levels. As we report in Table D.3, the effect of repression on turnout – instrumented by railroads as before – remains negative and significant. The impact of unemployment on turnout is negligible, but turnout is indeed greater where GRP is high.

Table D.2. Soviet repression does not drive contemporary economic performance. Table shows the results of regressions of total number of individuals resettled from each oblast on the oblast-year economic indicators (unemployment rates and gross regional product (GRP)), with oblast fixed effects.

	Dependent variable:	
	Unemployment (2003-2012)	GRP (2003-2012)
	(1)	(2)
log(Repression)	0.00	0.00
	(−0.01, 0.01)	(−0.005, 0.005)
Oblast FE	Y	Y
Year FE	Y	Y
Observations	46,936	49,209
Log Likelihood	−30,272.96	−24,245.12
Akaike Inf. Crit.	60,713.93	48,668.24
Note:	Standardized coefficients and 95% confidence intervals reported.	
	$'$p<0.1; *p<0.05; **p<0.01; ***p<0.001	

Table D.3. Repression effect remains after we account for economic conditions. Table shows the results of regressions of voter turnout from all elections between 2003-2014 on Soviet-era repression, while contolling for the unemployment rate, with fixed effects at the oblast and yearly levels.

Second stage results	*Dependent variable:*					
	Turnout (2003-2012)					
	(1)	(2)	(3)	(4)	(5)	(6)
log(Repression)	-0.22^{***}	-0.25^{***}	-0.18^{*}	-0.23^{***}	-0.26^{***}	-0.20^{*}
	$(-0.33, -0.11)$	$(-0.36, -0.14)$	$(-0.36, -0.01)$	$(-0.33, -0.12)$	$(-0.37, -0.15)$	$(-0.38, -0.03)$
Unemployment	-0.002	-0.002	-0.002			
	$(-0.02, 0.02)$	$(-0.02, 0.02)$	$(-0.02, 0.02)$			
GRP				0.16^{***}	0.16^{***}	0.16^{***}
				(0.14, 0.18)	(0.14, 0.18)	(0.14, 0.18)
Oblast FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	30,979	30,979	30,979	32,249	32,249	32,249
R^2	0.39	0.38	0.39	0.38	0.38	0.39
Adjusted R^2	0.38	0.38	0.39	0.38	0.37	0.39
Residual Std. Error	0.73 (df = 30894)	0.74 (df = 30894)	0.73 (df = 30894)	0.73 (df = 32159)	0.74 (df = 32159)	0.73 (df = 32159)
Weak instruments	341.17^{***}	302.08^{***}	125.99^{***}	356.03^{***}	320.93^{***}	131.07^{***}
Wu-Hausman	16.27^{***}	19.03^{***}	4.1^{*}	18.32^{***}	21.61^{***}	5.46^{*}

Note: Standardized coefficients and 95% confidence intervals reported.
$'p<0.1$; $^{*}p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$

E Determinants of electoral fraud, 2012

To examine how electoral fraud affects our results, we used finite mixture models (Mebane, 2016) to evaluate the likelihood of fraud in the 2012 presidential elections. Mebane (2016)'s finite mixture likelihood for fraud estimation uses the simulation protocol described by **?** as a point of departure. The model's baseline assumption is election fraud manifests as the addition of votes to the winner's share – either from the opposition or from nonvoters. The proportion of votes shifted from these two sources vary: *incremental fraud* leads to a shift in moderate proportions of the votes, and *extreme fraud* leads to a shift in almost all of the votes. Three types of vote results emerge from this process: those without fraud, those with incremental fraud, and those with extreme fraud.

The finite mixture likelihood model assumes n electoral units and N_i number of eligible voters in each unit, where $i = 1, ..., n$. The number of observed nonvotes is $A_i = N_i - W_i - O_i$, where W_i is the count of votes for the leading party, and O_i is the sum of votes cast for opposition. Thus, the number of valid votes is $V_i = N_i - A_i$. The protocol involving two kinds of fraud is then applied to each observation i, such that:

1. Sample turnout: $\tau \sim N(\tau, \sigma_\tau)$, subject to $0 \leq \tau_i \leq 1$.
2. Sample the leading party's vote proportion: $v_i \sim N(v, \sigma_v)$, subject to $0 \leq v_i \leq 1$.
3. Incremental fraud: with probability f_i sample the proportion of nonvotes that are turned into votes: $x_i \sim |N(0, \theta)|$, subject to $0 < x_i < 1$. The number of votes for the leading party is set as $W_i = N_i(\tau_i v_i + x_i(1 - \tau_i) + x_i^\alpha(1 - v_i)\tau_i)$, the number of votes for the opposition as $O_i = N_i(1 - x_i^\alpha)(1 - v_i)\tau_i$, and the number of voters as $A_i = N_i(1 - x_i)(1 - \tau_i)$. Exponent α measures the degree of vote stealing or more manufacturing. When $\alpha = 1$, votes are equally influenced by both processes. If $\alpha < 1$, then $x_i < x_i^\alpha$ and vote stealing is more important. When $\alpha > 1$, $x_i > x_i^\alpha$ and manufacturing votes from nonvoters is more important.
4. Extreme fraud: with probability f_e sample the proportion of nonvotes that are not turned into votes: $y_i \sim |N(0, \sigma_x)|, \quad \sigma_x = 0.075$, subject to $0 < y_i < 1$. The number of votes for the leading party is set as $W_i = N_i(\tau_i v_i + (1 - y_i)(1 - \tau_i) + (1 - y_i)^\alpha(1 - v_i)\tau_i)$, the number of votes for the opposition as $O_i = N_i(1 - (1 - y_i)^\alpha)(1 - v_i)\tau_i$, and the number of nonvoters as $A_i = N_i y_i(1 - \tau_i)$. When $\alpha < 1$, then $1 - y_i < (1 - y_i)^\alpha$ and vote stealing is more important. When $\alpha > 1$, then $1 - y_i > (1 - y_i)^\alpha$ and the manufacturing votes from nonvoters is more important.
5. No fraud: with probability $f_0 = 1 - f_i - f_e$, the number of votes for the leading party is $W_i = N_i \tau_i v_i$; the number of votes for the opposition is $O_i = N_i \tau_i (1 - v_i)$; and the number of nonvoters is $A_i = N_i(1 - \tau_i)$.

Larger proportions of votes are shifted from opposition to the leading party when the value of α is large. The finite mixture likelihood is

$$\mathcal{F}(\mathbf{W}, \mathbf{A}|\mathbf{N}; \mathbf{\Psi}) = \sum_{j \in \{0,i,e\}} f_j \prod_{i=1}^{n} g_{jW}(W_i|N_i; \mathbf{\Psi}) g_{jA}(A_i|N_i; \mathbf{\Psi}),$$

where f_0, f_i and f_e are probabilities, with $f_0 + f_i + f_e = 1$. An expectation-maximization (EM) algorithm with random starting values is used to estimate parameter vector Ψ and probabilities f_0, f_i and f_e. For each polling station, the model estimates the probability that observation is a case of no fraud, incremental fraud or extreme fraud.

Tables E.1 reports the correlates of incremental and extreme fraud in Russia's 2012 presidential elections. Table E.2 reports additional sensitivity analysis results for localities with low and high probabilities of each type of fraud.

Table E.1. Soviet-era repression increases probability of extreme voter fraud. Values shown are standardized regression coefficients from quasi-binomial models. 95% confidence intervals in parentheses.

	Dependent variable:	
	Pr(Incremental fraud)	Pr(Extreme fraud)
	(1)	(2)
SD(Elevation)	-0.02	0.28^{***}
	$(-0.07, 0.03)$	$(0.17, 0.39)$
Urbanization (1926)	-0.09^{**}	-0.58^{*}
	$(-0.15, -0.03)$	$(-1.10, -0.06)$
log(Repression)	-0.04	-0.19^{***}
	$(-0.09, 0.02)$	$(-0.30, -0.09)$
qAIC	8491	1231
Region FE	Y	Y
Observations	5,490	5,490
Note:		*p<0.05; **p<0.01; ***p<0.001

Table E.2. Effect of repression on voter turnout is smaller where there is less fraud. Values shown are standardized regression coefficients(effect of standard deviation increase in repression on standard deviation change in voter turnout). 95% confidence intervals in parentheses. Low fraud: Pr(Fraud)<average; high fraud: Pr(Fraud)>average.

Instrumental variable	Local Pr(Fraud)	Type of fraud	
		Incremental	Extreme
IV: distance to rail station	Low fraud	-0.39 (-0.64,-0.14)	-0.77 (-1.27,-0.27)
IV: distance to rail station	High fraud	-0.88 (-1.43,-0.34)	-1.21 (-1.77,-0.64)
IV: distance to rail line	Low fraud	-0.43 (-0.72,-0.13)	-0.76 (-1.28,-0.24)
IV: distance to rail line	High fraud	-0.72 (-1.19,-0.25)	-1.18 (-1.76,-0.59)
IV: distance to Gulag	Low fraud	-0.21 (-0.37,-0.05)	-0.39 (-0.68,-0.09)
IV: distance to Gulag	High fraud	-0.93 (-1.4,-0.45)	-1.1 (-1.45,-0.76)

F Repression and vote share

In this section, we examine whether – when they do vote – historically repressed communities are more likely to vote for the political opposition. Higher opposition support in repressed areas would indicate that decreased turnout is masking anti-regime political preferences, rather than simply a decreased interest in politics. Table F.1 and Figure F.1 report standardized coefficient estimates from regressions of opposition and pro-Putin vote shares on repression, using the same specification as for turnout.[2] The results suggest that opposition support is consistently higher – and Putin's is consistently lower – in historically repressed areas, across all elections. Since these same communities are also less likely to vote in the first place, the evidence suggests that exposure to past repression has made some Russian voters stay home, rather than express anti-regime preferences at the ballot box.

Table F.1. Repression increases opposition vote share, reduces Putin's vote share. Table shows the second-stage estimates of the repression effect on Putin's vote-share using the Moran eigenvector approach.

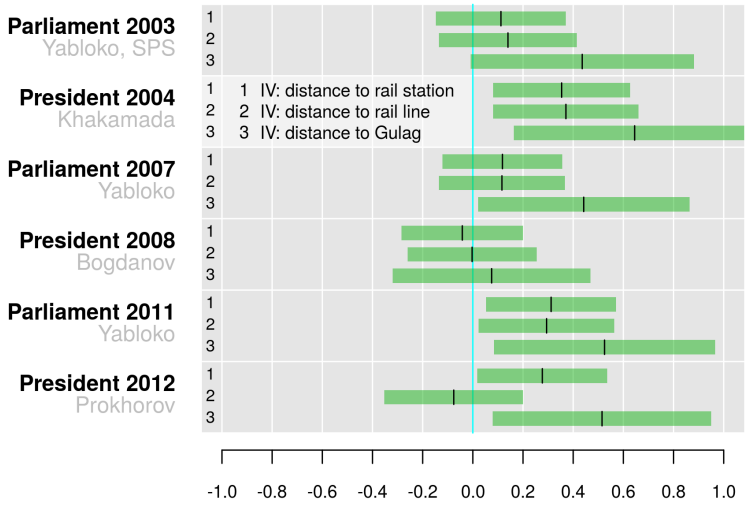
Second stage results	*Dependent variable:*					
	Liberal vote (2012)			Putin vote (2012)		
	(1)	(2)	(3)	(4)	(5)	(6)
log(Repression)	0.27^{*} (0.02, 0.53)	-0.07 (-0.35, 0.20)	0.51^{*} (0.08, 0.94)	-0.79^{***} (-1.07, -0.50)	-0.69^{***} (-0.98, -0.41)	-0.62^{**} (-1.05, -0.20)
First stage results	*Dependent variable:* log(Repression)					
Distance to station	-0.73^{***} (-0.91, -0.56)			-0.73^{***} (-0.91, -0.56)		
Distance to railroad		-0.69^{***} (-0.87, -0.52)			-0.69^{***} (-0.87, -0.52)	
Distance to Gulag			-0.12^{***} (-0.17, -0.08)			-0.12^{***} (-0.17, -0.08)
Oblast FE	Y	Y	Y	Y	Y	Y
Observations	7,026	7,026	7,026	7,026	7,026	7,026
R^2	0.38	0.37	0.32	0.18	0.25	0.30
Adjusted R^2	0.37	0.36	0.31	0.17	0.24	0.29
Residual Std. Error (df = 6942)	0.78	0.78	0.81	0.87	0.83	0.80
Weak instruments	67.51***	60.79***	26.18***	67.51***	60.79***	26.18***
Wu-Hausman	1.1	2.47	3.19′	39.03***	26.77***	9.12**

Note: Standardized coefficients and 95% confidence intervals reported.
′p<0.1; *p<0.05; **p<0.01; ***p<0.001

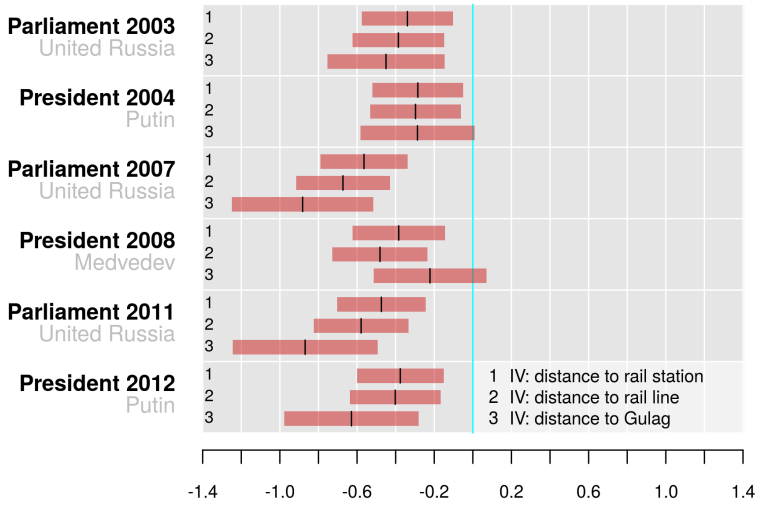
[2] Our definition of Russian opposition parties extends to liberal parties (e.g. Yabloko, SPS), but excludes the "loyal opposition" to United Russia (e.g. LDPR, CPRF, Just Russia).

Figure F.1. Effect of repression on vote share.

(a) Opposition vote share



(b) Pro-Putin vote share



References

Afonina, G M (1996) *Kratskie svedeniya o razvitii otechestvennykh zheleznykh dorog s 1838 po 1990 g. [Summary of domestic railroad development from 1838 to 1990]*. Ministry of Railways of the Russian Federation, Moscow.

Clem, Ralph S & Craumer, Peter R (1997) Urban-rural voting differences in Russian elections, 1995-1996: A rayon-level analysis. *Post-Soviet Geography and Economics*, 38(7): 379–395.

Colton, Timothy J & Hale, Henry E (2009) The Putin vote: Presidential electorates in a hybrid regime. *Slavic Review*, 68(3): 473–503.

Gehlbach, Scott (2000) Shifting electoral geography in Russia's 1991 and 1996 presidential elections. *Post-Soviet Geography and Economics*, 41(5): 379–387.

Konitzer-Smirnov, Andrew (2003) Incumbent electoral fortunes and regional economic performance during Russia's 2000-2001 regional executive election cycle. *Post-Soviet Affairs*, 19(1): 46–79.

McFaul, Michael (1997) *Russia's 1996 presidential election: The end of polarized politics*. Hoover Press.

Mebane, Walter R, Jr. (2016) Election forensics: Frauds tests and observation-level frauds probabilities. Prepared for presentation at the 2016 Annual Meeting of the Midwest Political Science Association, Chicago, IL, April 7–10.

Panov, Petr & Ross, Cameron (2013) Sub-national elections in Russia: Variations in United Russia's domination of regional assemblies. *Europe-Asia Studies*, 65(4): 737–752.

Rose, Richard (2007) The impact of president Putin on popular support for Russia's regime. *Post-Soviet Affairs*, 23(2): 97–117.

Treisman, Daniel (2011) Presidential popularity in a hybrid regime: Russia under Yeltsin and Putin. *American Journal of Political Science*, 55(3): 590–609.

White, Stephen & Mcallister, Ian (2008) The Putin phenomenon. *Journal of Communist Studies and Transition Politics*, 24(4): 604–628.