Online Appendix:

"Population Resettlement in War: Theory and Evidence from Soviet Archives"

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Contents

1 Appendix O-1: Resettlement in an International Context

The following section enumerates the list of counterinsurgency campaigns (1816-2006) that featured the systematic use of resettlement. The list includes 90 of the 307 cases in the Lyall and Wilson (2009) dataset. The five most prolific practitioners of resettlement have been the United States (13 conflicts), Russia/USSR (11), the UK (5), China (5) and Germany (4). Practitioners are about evenly divided between democracies and autocracies, with a median Polity II democracy score of -3 for incumbents who used resettlement and 1 for those who did not (Polity II: -10 for full autocracy and 10 for full democracy). Resettlement has not been confined to any particular region. 29 percent of counterinsurgency campaigns involving resettlement took place in Subsaharan Africa, 21 in Europe, 19 in Asia, 18 in the Western Hemisphere and 10 in the Greater Middle East. Resettlement is also not a historical vestige of 19th-century colonial and frontier warfare. The median resettlement campaign started in the year 1949, compared to 1942 for all others.

Table 1: Resettlement in Counterinsurgency, 1808-2006 (part 1 of 2). Sample drawn from Lyall and Wilson (2009)'s counterinsurgency dataset

Conflict (chronological order)	Description
Russia v. Chechens (1816-1825)	resettlement to low-lying areas, protected villages
China v. Turkmen tribes (1825-1828)	scorched earth
Russia v. Circassians (1829-1840)	mass deportation, ethnic cleansing
Russia v. Ghazi Muhammad/Shamil (1830-1859)	resettlement to low-lying areas
USA v. Sauk and Fox Indians (1832-1832)	Indian reservations
USA v. Seminoles (1835-1842)	Indian reservations
China v. Taiping Heavenly Kingdom (1851-1871)	scorched earth
USA v. Yakima (1855-1858)	Indian reservations
USA v. Seminoles (1855-1858)	Indian reservations
China v. Yunnan-based Muslim Insurgents (1856-1873)	scorched earth
USA v. Navajo (1860-1865)	Indian reservations
USA v. Apaches (1860-1865)	Indian reservations
China v. Nien (1860-1868)	scorched earth
USA v. Sioux (1862-1864)	Indian reservations
China v. Muslin tribesmen of Sinkiang (1863-1877)	resettlement to arable land
Russia v. Poland (1863-1864)	punitive deportation
USA v. Sioux (1865-1868)	Indian reservations
Spain v. Cuban rebels (Mambises) (1868-1878)	concentration camps
France v. Algerians(Kabylie) (1871-1872)	punitive deportation to Pacific
Netherlands v. Achinese (1873-1904)	scorched earth
USA v. Red River Indians (1874-1875)	Indian reservations
USA v. Apaches (Geronimo) (1876-1886)	Indian reservations
USA v. Sioux (1876-1877)	Indian reservations
Russia v. Albik Hajji Aldanov (Dagestan) (1877-1878)	resettlement to protected villages
Argentina v. Ranqueles Indians (1879-1884)	expulsion
Spain v. Cuban rebels (1895-1898)	concentration camps
Brazil v. Jacundos (1896-1897)	scorched earth
USA v. Filipino rebels (1898-1902)	protected villages
UKG v. Boers (1899-1902)	concentration camps
Germany v. Herero and Nama (1903-1908)	relocation of civilians to desert
Germany v. Maji Maji (1905-1907)	scorched earth
Soviet Union v. Shaykh Uzun Haji (zikrists) (1918-1925)	resettlement of Cossacks to clear land for Chechens
Soviet Union v. Greens (1920-1921)	punitive deportation
Italy v. Sanusi (1920-1931)	detention camps for nomads
UKG v. Arab rebels (1936-1939)	village occupation
Japan v. Chinese rebels (1937-1945)	protected hamlets
Soviet Union v. Israilov/Sheripov (1940-1944)	mass deportation to Central Asia

Table 2: Resettlement in Counterinsurgency, 1808-2006 (part 2 of 2). Sample drawn from Lyall and Wilson (2009)'s counterinsurgency dataset

Conflict (chronological order)	Description
Germany v. Belorussian/Ukrainian (1941-1944)	forced labor migration
Germany v. Poles/Jews (1944-1944)	neighborhood evictions
UKG v. Shifta (1945-1952)	concentration camps
Greece v. DSE (1945-1949)	protected villages
Philippines v. Huk (1946-1951)	protected villages
Soviet Union v. Forest Brothers (1946-1956)	relocation to special settlements
Soviet Union v. Ukrainian rebels (1946-1953)	relocation to special settlements
Burma v. Kachin and Karen (KNU,KNLA) (1948-1994)	village relocation
UKG v. Communists (1950-1960)	new villages
UKG v. Mau Mau (1952-1956)	mass relocation
France v. Algerians (1954-1962)	concentration camps
South Vietnam v. Vietcong (1960-1965)	strategic hamlets
Portugal v. Angola (1961-1975)	protected villages
Oman v. DLF (1962-1975)	protected villages
Portugal v. GB Rebels (PAIGC) (1962-1974)	protected villages
Portugal v. Frelimo (1962-1975)	protected villages
Rwanda v. Rebels (1963-1966)	ethnic cleansing
Kenya v. NFDLF (1964-1969)	protected villages
South Vietnam v. Vietcong/NVA (1965-1975)	strategic hamlets
USA v. Vietcong/NVA (1965-1975)	strategic hamlets
South Africa v. SWAPO (1966-1989)	resettlement in Caprivi and Okavango
Zimbabwe v. ZANU, ZAPU (1966-1979)	protected villages
Cambodia v. FUNK (1970-1975)	deurbanization
Burundi v. Hutu rebels (1972-1972)	ethnic cleansing
Zimbabwe v. ZANU (1972-1979)	protected villages
Ethiopia v. Eritrea (1974-1991)	mass relocation
Indonesia v. Fretilin (1975-1999)	resettlement camps
Indonesia v. GAM (1976-2005)	scorched earth
Cambodia v. Khmer Rouge (1978-1992)	forcible refugee return
Iran v. KDPI (1979-1996)	scorched earth
Soviet Union v. Afghanistan (1980-1989)	scorched earth
Nicaragua v. Contras (1981-1988)	forced removal of Indians to relocation centers
Uganda v. NRA (1981-1987)	population removal
Turkey v. Kurds (1983-1999)	village depopulation
Sudan v. SPLM, SPLM-faction (1983-2004)	conscription into slavery
Israel v. Palestinian (1987-1993)	selective deportation to Lebanon
Mali v. Tuaregs (1989-1995)	resettlement camps
Yugoslavia v. Croatia (1991-1991)	ethnic cleansing
Burundi v. Palipehutu, CNDD (1991-2006)	ethnic cleansing
Sierra Leone v. RUF (1991-1999)	strategic hamlets
Tajikistan v. UTO (1992-1997)	ethnic cleansing
Azerbaijan v. Armenia (1992-1994)	ethnic cleansing
Bosnia v. Croats (1992-1995)	ethnic cleansing
Croatia v. Krajina (1992-1995)	ethnic cleansing
Georgia v. Abkhazia (1992-1994)	ethnic cleansing
Burundi v. FDD (1993-2005)	ethnic cleansing
Serbia v. KLA (1994-1999)	ethnic cleansing
Rwanda v. RPF (1994-1994)	ethnic cleansing
Rwanda v. ALiR (1994-2000)	ethnic cleansing
DRC v. AFDL (1994-1997)	forcible refugee return
DRC v. RCD (1994-1998)	forcible refugee return
Uganda v. LRA (1994-2006)	protected villages
Sudan v. SLM/A, JEM (2003-2006)	scorched earth

2 Appendix O-2: Model Extensions

Table 3: NOTATION TABLE

SYMBOL	DESCRIPTION
POPULATION PARAMETERS	
$C_t \in [0, \infty)$	total neutral civilians at time t
$R_t \in [0, \infty)$	total rebel supporters at time t
$G_t \in [0, \infty)$	total government supporters at time t
STRATEGY CHOICES	
$\rho_R \in (0, \infty)$	rebels' rate of violence (s_R)
$\rho_G \in (0, \infty)$	government's rate of violence (s_{G1})
$r \in (0, 1 - f(\sum_i \rho_i))$	proportion of civilian population resettled (s_{G2})
EXOGENOUS PARAMETERS	
$\theta_i \in (0, 1)$	combatant i's selectivity, with $\theta_R > \theta_G$
$\alpha_i \in [0, \infty)$	combatant i's mobilizational capacity, with $\alpha_G > \alpha_R$
$k \in (0, \infty)$	constant civilian immigration rate
$u \in (0, \infty)$	constant population death rate
ENDOGENOUS PARAMETERS	
$\mu_i = 1 - \frac{\rho_{-i}\theta_{-i}}{\rho_{-i}+\rho_i}$	rate of civilian cooperation with combatant $i \in \{G, R\}$ ($s_C 1$)
$\mu_i^* = (1-d)\left(1 - \frac{\rho_{-i}\theta_{-i}}{\rho_{-i}+\rho_i}\right) + \alpha_i$	
$d = r + f(\sum_i \rho_i) \in (0, 1)$	rate of civilian displacement
$f(\sum_i \rho_i) \in (0, 1 - r)$	rate of civilian flight (s_{C2})
OBJECTIVE FUNCTIONS	
$\pi_C(\mathbf{s}) = -\kappa(i)$	costs associated with membership in group $i \in \{G, R, C\}$
	$\kappa(G) = \rho_R\theta_R, \kappa(R) = \rho_G\theta_G$, and $\kappa(C) = \rho_R(1-\theta_R) + \rho_G(1-\theta_G)$
$\pi_G(\mathbf{s}) = \frac{G_{eq}}{G_{eq}+R_{eq}}$	equilibrium share of popular support
$\pi_R(\mathbf{s}) = \frac{R_{eq}}{G_{eq}+R_{eq}}$	equilibrium share of popular support

The theoretical model presented in the main text rests on the assumption that civilians are purely security-seeking actors, who base their decisions to cooperate on the relative costs associated with supporting the government or rebels. The following section examines how the model's results (Propositions 1 and 2) may change if we loosen this assumption. I show that – if civilians respond to positive inducements (rewards) as well as negative ones (punishment) – a selective violence advantage is neither necessary nor sufficient for government victory. However, strong incentives for escalation emerge if the rebels offer a more generous reward package to their potential supporters. These same conditions generate powerful incentives to use resettlement.

Positive inducements (without resettlement)

Can a combatant with a disadvantage in selective violence simply "buy" civilian support? Let $\iota_i \in [0, \infty)$ be the size of a reward package combatant i offers to her supporters. These rewards may include material incentives, like land and loot, or less tangible ones, like the ideological proximity between civilians' and combatants' ideal points in some k-dimensional policy space. We will assume that these rewards are distributed in wartime, and do not depend on the perceived probability of either side's eventual success.

If civilians respond to positive as well as negative inducements in deciding whether to cooperate with each side, we need a new expression for their cooperation strategy μ_i^*. This expression must be decreasing in the amount of punishment civilians expect to receive as a supporter of i, increasing in the expected rewards, and remain globally non-negative. A simple formulation that meets these conditions is

$$\mu_R^* = 1 - \frac{\rho_G \theta_G}{\rho_G + \rho_R} + \iota_R = \mu_R + \iota_R \tag{1}$$

$$\mu_G^* = 1 - \frac{\rho_R \theta_R}{\rho_G + \rho_R} + \iota_G = \mu_G + \iota_G \tag{2}$$

which can be substituted into the original system of equations to yield:

$$\frac{\delta C}{\delta t} = k - (\mu_R^* R_t + \mu_G^* G_t - \rho_R(1-\theta_R) - \rho_G(1-\theta_G) - u)\, C_t \tag{3}$$

$$\frac{\delta G}{\delta t} = (\mu_G^* C_t - \rho_R \theta_R - u) G_t \tag{4}$$

$$\frac{\delta R}{\delta t} = (\mu_R^* C_t - \rho_G \theta_G - u) R_t \tag{5}$$

Lemma 2. *There exist two equilibrium solutions to (3-5) in which the outcome of the fighting does not depend on the initial balance of forces: government victory and rebel victory.*

Proof. Define a *government victory equilibrium* of (3-5) as a fixed point satisfying $\frac{\delta C}{\delta t} = 0, \frac{\delta G}{\delta t} = 0, \frac{\delta R}{\delta t} = 0$, $C_{eq} \in [0, \infty), G_{eq} \in [0, \infty), R_{eq} \in [0, \infty)$ and $\pi_G(\mathbf{s}) = 1, \pi_R(\mathbf{s}) = 0$. These conditions are satisfied at

$$C_{eq} = \frac{\rho_R \theta_R + u}{\mu_G + \iota_G} \tag{6}$$

$$G_{eq} = \frac{k}{\rho_R \theta_R + u} - \frac{\rho_G(1-\theta_G) + \rho_R(1-\theta_R) + u}{\mu_G + \iota_G} \tag{7}$$

$$R_{eq} = 0 \tag{8}$$

This equilibrium exists (i.e. yields non-negative equilibrium group sizes) for all $\rho_G \in (0, \infty), \rho_R \in (0, \infty), \theta_G \in [0, 1], \theta_R \in [0, 1], \iota_G \in [0, \infty), \iota_R \in [0, \infty), k \in (0, \infty), u \in (0, \infty)$, with $\mu_i = 1 - \frac{\rho_{-i}\theta_{-i}}{\rho_{-i} + \rho_i}$.

Define a *rebel victory equilibrium* of (3-5) as a fixed point satisfying $\frac{\delta C}{\delta t} = 0, \frac{\delta G}{\delta t} = 0, \frac{\delta R}{\delta t} = 0$, $C_{eq} \in [0, \infty), G_{eq} \in [0, \infty), R_{eq} \in [0, \infty)$ and $\pi_G(\mathbf{s}) = 0, \pi_R(\mathbf{s}) = 1$. These conditions are satisfied at

$$C_{eq} = \frac{\rho_G \theta_G + u}{\mu_R + \iota_R} \tag{9}$$

$$G_{eq} = 0 \tag{10}$$

$$R_{eq} = \frac{k}{\rho_G \theta_G + u} - \frac{\rho_G(1-\theta_G) + \rho_R(1-\theta_R) + u}{\mu_R + \iota_R} \tag{11}$$

This equilibrium exists (i.e. yields non-negative equilibrium group sizes) for all $\rho_G \in (0, \infty), \rho_R \in (0, \infty), \theta_G \in [0, 1], \theta_R \in [0, 1], \iota_G \in [0, \infty), \iota_R \in [0, \infty), k \in (0, \infty), u \in (0, \infty)$, with $\mu_i = 1 - \frac{\rho_{-i}\theta_{-i}}{\rho_{-i} + \rho_i}$. □

Proposition 4. *If combatants can attract civilian support with rewards as well as punishment, a selective violence advantage is neither a necessary nor a sufficient condition for victory.*

Table 4: Stability conditions for government victory, without resettlement.

Selective Violence	Positive Inducements	
	G advantage ($\iota_G > \iota_R$)	R advantage ($\iota_G < \iota_R$)
G advantage $\left(\frac{\rho_G\theta_G}{\rho_R\theta_R} > 1\right)$	Stable	Stable if $\iota_R < \bar{\iota}_R$
R advantage $\left(\frac{\rho_G\theta_G}{\rho_R\theta_R} < 1\right)$	Stable if $\iota_R < \bar{\iota}_R, \iota_G > \underline{\iota_G}$	Unstable

Proof. Assume $\rho_G \in (0,\infty), \rho_R \in (0,\infty), \theta_G \in [0,1], \theta_R \in [0,1], \iota_G \in [0,\infty), \iota_R \in [0,\infty)$. To ensure nonnegative population values, we also impose a lower bound on immigration parameter $k > \frac{(\rho_R\theta_R+u)(\rho_G(1-\theta_G)+\rho_R(1-\theta_R)+u)}{\mu_G+\iota_G}$, with $\mu_G = 1 - \frac{\rho_R\theta_R}{\rho_R+\rho_G}$. By linearization, a government victory equilibrium is stable if all the eigenvalues of the Jacobian matrix of the system in (3-5), evaluated at fixed point (6-8), have negative real parts, or $\det(\mathbf{J}) > 0, \mathrm{tr}(\mathbf{J}) < 0$. These conditions hold if (a) $\frac{\rho_G\theta_G}{\rho_R\theta_R} > 1$, $\iota_R < \bar{\iota}_R$, or (b) $\frac{\rho_G\theta_G}{\rho_R\theta_R} < 1$, $\iota_R < \bar{\iota}_R$, $\iota_G > \underline{\iota_G}$, where $\bar{\iota}_R = \frac{\rho_G\theta_G-\rho_R\theta_R}{\rho_R\theta_R+u}\left(\frac{\iota_G(\rho_G\theta_G+u)}{\rho_G\theta_G-\rho_R\theta_R} + \frac{u}{\rho_G+\rho_R} + 1\right)$ and $\underline{\iota_G} = \frac{(\rho_G+\rho_R+u)(\rho_R\theta_R-\rho_G\theta_G)}{(\rho_G\theta_G+u)(\rho_G+\rho_R)}$ □

If we drop the assumption that cooperation is driven solely by the pursuit of security, and allow the civilians' objective function to be a combination of damage limitation and profit maximization, then selective violence ceases to be an indispensable condition for victory (Proposition 4). A combatant offering sufficiently generous rewards to her supporters can win the contest despite a selective violence disadvantage; a combatant who offers too little can lose despite an abundance of coercive leverage. The mere possibility of a low-coercion victory, however, does not imply that it is easily attainable. Securing a favorable outcome is far more demanding where one does not have a selective violence advantage.

The result depends on two critical values for positive inducements,

$$\bar{\iota}_R = \frac{\rho_G\theta_G - \rho_R\theta_R}{\rho_R\theta_R + u}\left(\frac{\iota_G(\rho_G\theta_G + u)}{\rho_G\theta_G - \rho_R\theta_R} + \frac{u}{\rho_G + \rho_R} + 1\right) \tag{12}$$

$$\underline{\iota_G} = \frac{(\rho_G + \rho_R + u)(\rho_R\theta_R - \rho_G\theta_G)}{(\rho_G\theta_G + u)(\rho_G + \rho_R)} \tag{13}$$

where $\bar{\iota}_R$ is an upper bound on rebel rewards and $\underline{\iota_G}$ is a lower bound on government rewards.

Table 4 summarizes the conditions under which a government victory equilibrium is stable, under four scenarios. In the first and best-case scenario (top left), the government generates more selective violence and offers greater positive inducements than the rebels. Here, a government victory equilibrium is always stable.

In the second scenario (upper right), civilians are more attracted to the rebels' reward package, but the government maintains its selective violence advantage. Government victory remains stable here as long as rebel rewards are not too high, with $\iota_R < \underline{\iota_R}$. As (12) shows, this critical value is monotonically increasing in ι_G. An increase in the government's rewards, in other words, raises the bar that rebels must clear in order to negate the former's coercive success.

In the third scenario (lower left), rebels have a selective violence advantage but the government offers greater positive incentives. For government victory to be sustainable under these conditions, it is necessary not only for rebel rewards to be very low ($\iota_R < \bar{\iota_R}$), but for government rewards to also be quite high ($\iota_G > \underline{\iota_G}$). The threshold value $\underline{\iota_G}$ depends in part on the scope of the government's selective violence disadvantage ($\rho_R\theta_R - \rho_G\theta_G$). The larger the coercive disadvantage, the greater the government's offer must be in absolute terms, beyond simply exceeding the rebels'. Note that $\bar{\iota_R}$ is a function of ι_G, and $\bar{\iota_R} = 0$ if $\iota_G = \underline{\iota_G}$. A government's failure to exceed this threshold, then, lowers the rebels' bar to a level that ensures the latter's success for all $\iota_R \in [0, \infty)$.

In the fourth and final scenario (lower right), the government has disadvantages in both selective violence and rewards. Under these worst of circumstances, a government victory equilibrium is never stable.

These results suggest that positive inducements can only compensate for a lack of coercive leverage if the gap between inducements offered by the two sides is rather vast. In this sense, rewards do not negate the importance of coercion. At best, they offer a substitute for punishment. The greater the government's selective violence disadvantage, the larger her rewards package must be. The flip side of this finding is that coercion – even on a massive scale – is not sufficient for victory. Even where the government has a selective violence advantage, the weaker rebels can attract more civilian cooperation by offering the more compelling set of positive incentives: a more lucrative package of private goods, a more appealing ideological platform, or more charismatic political and military leadership.

That said, generous rewards create powerful incentives for escalation. If we solve (12) for ρ_G and take a partial derivative with respect to ι_R, we obtain $\frac{\delta\rho_G}{\delta\iota_R} > 0$ for all nonnegative parameter values. A sudden increase in the rewards offered by rebels – all other things equal – compels the government to deter civilian realignment through an even higher level of coercion. For this reason, we should expect counterinsurgency to be particularly desperate and brutal where rebels have much more to offer the population.

Positive inducements (with resettlement)

Do incentives to resettle diminish when combatants use rewards to attract supporters? I now expand the model further by re-introducing resettlement as a brute-force means to interdict civilian cooperation with combatants. As before, let $d \in (0, 1)$ be the proportion of local civilians removed from the conflict zone by the government, and let $\alpha_i \in [0, \infty)$ be combatant i's mobilizational capacity, with $\alpha_G > \alpha_R$. This modification implies new cooperation rates

$$\mu_R^\dagger = (1 - d)\left(1 - \frac{\rho_G\theta_G}{\rho_G + \rho_R} + \iota_R\right) + \alpha_R \tag{14}$$

$$\mu_G^\dagger = (1 - d)\left(1 - \frac{\rho_R\theta_R}{\rho_G + \rho_R} + \iota_G\right) + \alpha_G \tag{15}$$

which are substituted into the original system of equations to yield

$$\frac{\delta C}{\delta t} = k - \left(\mu_R^\dagger R_t + \mu_G^\dagger G_t - \rho_R(1 - \theta_R) - \rho_G(1 - \theta_G) - u\right) C_t \tag{16}$$

$$\frac{\delta G}{\delta t} = (\mu_G^\dagger C_t - \rho_R\theta_R - u)G_t \tag{17}$$

$$\frac{\delta R}{\delta t} = (\mu_R^\dagger C_t - \rho_G\theta_G - u)R_t \tag{18}$$

Lemma 3. *There exist two equilibrium solutions to (32-34) in which the outcome of the fighting does not depend on the initial balance of forces: government victory and rebel victory.*

Proof. Define a *government victory equilibrium* of (3-5) as a fixed point satisfying $\frac{\delta C}{\delta t} = 0$, $\frac{\delta G}{\delta t} = 0$, $\frac{\delta R}{\delta t} = 0$, $C_{eq} \in [0, \infty), G_{eq} \in [0, \infty), R_{eq} \in [0, \infty)$ and $\pi_G(\mathbf{s}) = 1, \pi_R(\mathbf{s}) = 0$. These conditions are satisfied at

$$C_{eq} = \frac{\rho_R\theta_R + u}{\mu_G^\dagger} \tag{19}$$

$$G_{eq} = \frac{k}{\rho_R\theta_R + u} - \frac{\rho_G(1-\theta_G) + \rho_R(1-\theta_R) + u}{\mu_G^\dagger} \tag{20}$$

$$R_{eq} = 0 \tag{21}$$

This equilibrium exists (i.e. yields non-negative equilibrium group sizes) for all $\rho_G \in (0, \infty), \rho_R \in (0, \infty), \theta_G \in [0, 1], \theta_R \in [0, 1], \iota_G \in [0, \infty), \iota_R \in [0, \infty), \alpha_G \in [0, \infty), \alpha_R \in [0, \infty), k \in (0, \infty), u \in (0, \infty), d \in (0, 1)$, with $\mu_i^\dagger = (1-d)\left(1 - \frac{\rho_{-i}\theta_{-i}}{\rho_{-i}+\rho_i} + \iota_i\right) + \alpha_i$.

Define a *rebel victory equilibrium* of (32-34) as a fixed point satisfying $\frac{\delta C}{\delta t} = 0$, $\frac{\delta G}{\delta t} = 0$, $\frac{\delta R}{\delta t} = 0$, $C_{eq} \in [0, \infty), G_{eq} \in [0, \infty), R_{eq} \in [0, \infty)$ and $\pi_G(\mathbf{s}) = 0, \pi_R(\mathbf{s}) = 1$. These conditions are satisfied at

$$C_{eq} = \frac{\rho_G\theta_G + u}{\mu_R^\dagger} \tag{22}$$

$$G_{eq} = 0 \tag{23}$$

$$R_{eq} = \frac{k}{\rho_G\theta_G + u} - \frac{\rho_G(1-\theta_G) + \rho_R(1-\theta_R) + u}{\mu_R^\dagger} \tag{24}$$

This equilibrium exists (i.e. yields non-negative equilibrium group sizes) for all $\rho_G \in (0, \infty), \rho_R \in (0, \infty), \theta_G \in [0, 1], \theta_R \in [0, 1], \iota_G \in [0, \infty), \iota_R \in [0, \infty), \alpha_G \in [0, \infty), \alpha_R \in [0, \infty), k \in (0, \infty), u \in (0, \infty), d \in (0, 1)$, with $\mu_i^\dagger = (1-d)\left(1 - \frac{\rho_{-i}\theta_{-i}}{\rho_{-i}+\rho_i} + \iota_i\right) + \alpha_i$. □

Proposition 5. *Resettlement is necessary for government victory if the government has a selective violence disadvantage and/or government rewards are too low.*

Proof. Assume $\rho_G \in (0, \infty), \rho_R \in (0, \infty), \theta_G \in [0, 1], \theta_R \in [0, 1], \iota_G \in [0, \infty), \iota_R \in [0, \infty), \alpha_G \in [0, \infty), \alpha_R \in [0, \infty), d \in (0, 1)$, with $\alpha_G > \alpha_R$ and $\theta_R > \theta_G$. To ensure nonnegative population values, we also impose a lower bound on immigration parameter $k > \frac{(\rho_R\theta_R+u)(\rho_G(1-\theta_G)+\rho_R(1-\theta_R)+u)}{\mu_G^\dagger + \frac{\rho_G(1-\theta_G)(\alpha_G+\iota_G-d(1+\iota_G))}{\rho_G+\rho_R}}$, with $\mu_G^\dagger = (1-d)\left(1 - \frac{\rho_R\theta_R}{\rho_G+\rho_R} + \iota_G\right) + \alpha_G$. By linearization, a government victory equilibrium is stable if all the eigenvalues of the Jacobian matrix of the system in (32-34), evaluated at fixed point (19-21), have negative real parts, or $\det(\mathbf{J}) > 0, \mathrm{tr}(\mathbf{J}) < 0$. These conditions hold if (a) $\frac{\rho_G\theta_G}{\rho_R\theta_R} > 1$, $\iota_G > \iota_R$, (b) $\frac{\rho_G\theta_G}{\rho_R\theta_R} > 1$, $\iota_R < \bar{\iota_R}$, (c) $\frac{\rho_G\theta_G}{\rho_R\theta_R} > 1$, $\iota_R > \bar{\iota_R}$, $\iota_G > \underline{\iota_G}$, (d) $\frac{\rho_G\theta_G}{\rho_R\theta_R} > 1$, $\iota_R > \bar{\iota_R}$, $\iota_G < \underline{\iota_G}$, $d > \underline{d}$, (e) $\frac{\rho_G\theta_G}{\rho_R\theta_R} < 1$, $\iota_G > \underline{\iota_G}$, or (f) $\frac{\rho_G\theta_G}{\rho_R\theta_R} < 1$, $\iota_G < \underline{\iota_G}$, $d > \underline{d}$, where $\bar{\iota_R} = \frac{(\rho_G\theta_G - \rho_R\theta_R)(\rho_G+\rho_R+u)}{(\rho_R\theta_R+u)(\rho_G+\rho_R)}$, $\underline{\iota_G} = \frac{\iota_R(\rho_R\theta_R+u) - (\rho_G\theta_G - \rho_R\theta_R)\left(\frac{u}{\rho_G+\rho_R}+1\right)}{\rho_G\theta_G+u}$ and $\underline{d} = 1 - \frac{\alpha_G}{\underline{\iota_G} - \iota_G}$. □

Table 5: Stability conditions for government victory, with resettlement.

Selective Violence	Positive Inducements	
	G advantage ($\iota_G > \iota_R$)	R advantage ($\iota_G < \iota_R$)
G advantage $\left(\frac{\rho_G\theta_G}{\rho_R\theta_R} > 1\right)$	Stable	Stable if (a) $\iota_R < \bar{\iota_R}$, (b) $\iota_R > \bar{\iota_R}, \iota_G > \underline{\iota_G}$, or (c) $\iota_R > \bar{\iota_R}, \iota_G < \underline{\iota_G}, d > \underline{d}$
R advantage $\left(\frac{\rho_G\theta_G}{\rho_R\theta_R} < 1\right)$	Stable if (a) $\iota_G > \underline{\iota_G}$ or (b) $\iota_G < \underline{\iota_G}, d > \underline{d}$	Stable if $d > \underline{d}$

In and of themselves, positive inducements do not reduce incentives for resettlement. On the contrary, resettlement emerges as a powerful strategy of last resort where the government either lacks coercive leverage, is unable to offer an competitive set of rewards, or both (Proposition 5).

The result now depends on three critical values,

$$\bar{\iota_R} = \frac{(\rho_G\theta_G - \rho_R\theta_R)(\rho_G + \rho_R + u)}{(\rho_R\theta_R + u)(\rho_G + \rho_R)} \tag{25}$$

$$\underline{\iota_G} = \frac{\iota_R(\rho_R\theta_R + u) - (\rho_G\theta_G - \rho_R\theta_R)\left(\frac{u}{\rho_G+\rho_R} + 1\right)}{\rho_G\theta_G + u} \tag{26}$$

$$\underline{d} = 1 - \frac{\alpha_G}{\underline{\iota_G} - \iota_G} \tag{27}$$

where $\bar{\iota_R}$ is an upper bound on rebel rewards, $\underline{\iota_G}$ is a lower bound on government rewards, and $\underline{d}$ is a lower bound on resettlement.

Table 5 summarizes stability conditions for a government victory equilibrium, under the same four scenarios as before. In stark contrast to the results shown in Table 4, government victory is now always possible, under even the most unfavorable of circumstances. In the best-case scenario (upper left), where the government has an advantage in selective violence and positive inducements, a victory equilibrium is unconditionally stable and resettlement is unnecessary. Everywhere else, resettlement allows the government to compensate for an inability to attract supporters through coercion, persuasion, or both.

If the government has a selective violence disadvantage, but retains an advantage in positive inducements (lower left), resettlement reduces the size of the minimum reward package needed to win civilian cooperation. As long as the rate of resettlement exceeds the critical threshold $\underline{d}$, the government can achieve a sustainable victory without the need to offer substantial inducements to her supporters ($\iota_G < \underline{\iota_G}$).

If employed on a sufficiently large scale, resettlement can obviate the need to compete with rebels for popular support. Resettlement can offset a rebel advantage in rewards (upper right), even where this advantage is overwhelming ($\iota_R > \bar{\iota_R}, \iota_G < \underline{\iota_G}$). Most strikingly, resettlement offers a path to victory under the worst-case scenario of a double disadvantage in selective violence and positive inducements (lower right) – a situation which in Table 4 would have portended unconditional defeat.

The equilibrium rate of resettlement depends on the extent of the government's disadvantages in other areas. As is clear from the expression for $\underline{d}$ in (27), the threshold level of resettlement is decreasing in government rewards (ι_G) and – if $\iota_G < \underline{\iota_G}$ – mobilizational capacity (α_G). Substituting (26) for $\underline{\iota_G}$ in (27), and taking partial derivates, we also see that more resettlement is needed where rebel rewards are high $\left(\frac{\delta d}{\delta \iota_R} > 0\right)$, rebel control is extensive $\left(\frac{\delta d}{\delta \theta_R} > 0\right)$, and government control is limited $\left(\frac{\delta d}{\delta \theta_G} < 0\right)$.

In brief, incentives to resettle civilians are most compelling where the government is weakest – where her territorial control and operational intelligence are limited, where her mobilizational capacity is modest, where she cannot offer a competitive package of rewards to her supporters. This result holds regardless of the types of incentives to which civilians respond – negative as in Propositions 1-3 (main text), or both positive and negative as in Propositions 4 and 5. The model's central empirical implications are robust to this extension.

Time-Varying Intelligence

Can gradual improvements in intelligence change combatants' incentives? The previous analysis rested on the assumption that the ability of government forces or rebels to identify each others' opponents is a function of preexisting (i.e. prior to the fighting) levels of control or popular support. Although such assumptions are common in the civil war literature (Steele, 2011; Balcells, 2010, 2011), they are obviously violated in practice. The U.S. Army's counterinsurgency field manual, for instance, notes that the frequency and quality of reporting depends on the dynamics of fighting and recruitment: "Intelligence drives operations and successful operations generate additional intelligence" (Field Manual No. 3-24, 2006, 3.25). As the number of rebel supporters in a conflict zone declines – due to attrition or defection – it becomes safer for civilians to cooperate with government forces. Meanwhile, if government operations alienate the populace – due to a lack of coercive leverage or any of the other reasons described above – it becomes less safe for civilians to offer information.

Let $\theta_{it} \in [0, 1]$ be combatant i's selectivity at time t. Given a starting level of intelligence at time $t = 0$, this parameter changes over time as a function of relative combatant support in the conflict zone:

$$\theta_{G,t+\Delta t} = \begin{cases} \theta_{G,0} & \text{if } t = 0 \\ g\left(\frac{G_t}{R_t+G_t}\right) & \text{if } t > 0 \end{cases} \tag{28}$$

$$\theta_{R,t+\Delta t} = \begin{cases} \theta_{R,0} & \text{if } t = 0 \\ g\left(\frac{R_t}{R_t+G_t}\right) & \text{if } t > 0 \end{cases} \tag{29}$$

where $\theta_{i,0} \in [0, 1]$ is a constant initial value, $g(\cdot)$ is a monotone increasing, continuous function on $[0, 1]$, G_t is the number of active government supporters, R_t is the number of active rebel supporters, and $R_t + G_t$ is the total combatant population in the conflict zone at time t.

As the proportion of government supporters in the local combatant population increases, the counterinsurgent's intelligence improves, enabling the government to target rebels with higher precision and avoid civilian casualties. As the level of active support declines, the government's intelligence assets deteriorate, making it more difficult to generate selective violence.

By changing intelligence from a constant to a variable, we also induce changes to other parameters in the system, which depend directly or indirectly on θ. If $\theta_{i,t}$ is substituted for θ_i in the expressions for civilian cooperation μ_i, we obtain time-varying civilian strategies

$$\mu_{R,t+\Delta t} = 1 - \frac{\rho_G \theta_{G,t}}{\rho_G + \rho_R} \tag{30}$$

$$\mu_{G,t+\Delta t} = 1 - \frac{\rho_R \theta_{R,t}}{\rho_G + \rho_R} \tag{31}$$

and a more complicated system of equations

$$\frac{\delta C}{\delta t} = k - \left(\mu_{R,t} R_t + \mu_{G,t} G_t - \rho_{R,t}(1-\theta_{R,t}) - \rho_{G,t}(1-\theta_{G,t}) - u\right) C_t \tag{32}$$

$$\frac{\delta G}{\delta t} = (\mu_{G,t} C_t - \rho_{R,t}\theta_{R,t} - u) G_t \tag{33}$$

$$\frac{\delta R}{\delta t} = (\mu_{R,t} C_t - \rho_{G,t}\theta_{G,t} - u) R_t \tag{34}$$

Compared to the original equations, the system now includes several new sets of endogenous, time-varying parameters. The only static terms remaining in the model are the immigration and death rates k, u. Intelligence ($\theta_{i,t}$) changes as a function of R_t, G_t and civilian cooperation ($\mu_{i,t}$) changes as a function of $\theta_{i,t}$. We also allow coercive strategies ($\rho_{i,t}$) to adapt as new intelligence comes to light and opponents change their behavior.

These changes imply a new stalemate threshold

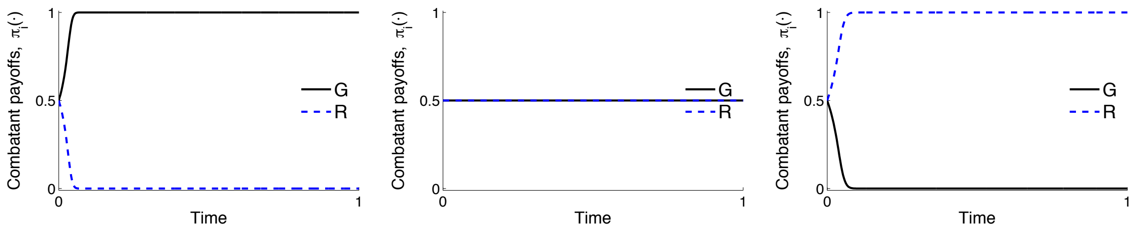
$$\rho^*_{i,t+\Delta t} = \rho_{-i,t} \frac{\theta_{-i,t}}{\theta_{i,t}} \tag{35}$$

To outbid her opponent, each combatant must determine an optimal level of force at the outset of the fighting, based on her opponent's initial level of force and the initial balance of intelligence, and then update it iteratively with new values of $\theta_{i,t}$ and $\rho_{-i,t}$.

These modifications render the system in (32-34) too complex for a closed-form equilibrium solution of the type derived for Lemmas 2-4. To gain analytical traction and describe the behavior of the dynamical system over time, we turn to numerical methods. Specifically, we use 4th and 5th order Runge-Kutta numerical integration to solve the differential equations.

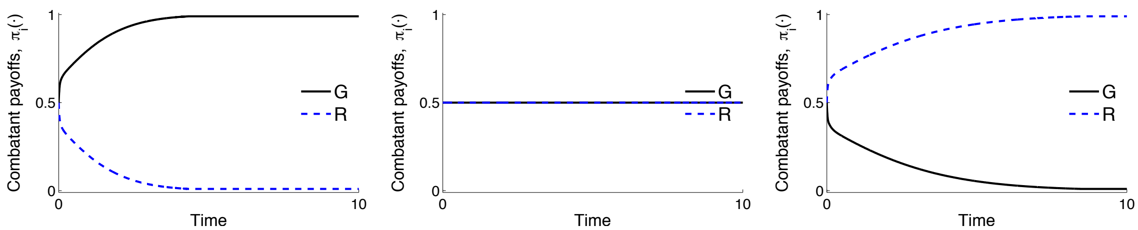
For the purpose of the simulations, we assume a conflict zone that is at $t = 0$ evenly contested by government and rebel supporters, and populated predominantly by neutral civilians, with $C_0 = 100, R_0 = 5, G_0 = 5$. For simplicity, we assume that sovereignty is at the outset of the fighting equally divided between the combatants, and the identification problem is initially uniform, with $\theta_{G,0} = \theta_{R,0} = .5$. We take the intelligence gathering function $g(x) = gx$ to be linear, with $g = 1$. To ensure non-negative population values we choose a k above the lower bound described in the proof to Proposition 1 ($k = 1000$), and take $u = 1$.

How do improvements or deteriorations in intelligence impact the dynamics of irregular war? As Figure 2 suggests, the difference is one of duration rather than outcome. The equilibria reached (victory, stalemate, defeat) are the same as those with fixed intelligence (Figure 1). However, the system converges to these equilibria more slowly than with fixed θ_i. What accounts for the longer duration? As the relative quality of intelligence changes over time (i.e. one combatant's ability to identify opponents improves, while the other's declines), one side's use of coercion consequently becomes more selective, while the other's becomes more indiscriminate. As a result, cooperation with the indiscriminate side becomes gradually more costly, and civilians respond to this change



(a) $\rho_G > \rho_G^*$ (b) $\rho_G = \rho_G^*$ (c) $\rho_G < \rho_G^*$

Figure 1: Fixed intelligence



(a) $\rho_G > \rho_G^*$ (b) $\rho_G = \rho_G^*$ (c) $\rho_G < \rho_G^*$

Figure 2: Time-varying intelligence

by cooperating at greater rates with the more selective combatant. The indiscriminate combatant responds to civilian defection by attempting to make cooperation with her opponent more costly – escalating violence, even if this violence is very inefficient. As civilian cooperation with the opponent slows down, and the opponent becomes herself starved of new intelligence, her own violence becomes more indiscriminate and she faces the same pressures to escalate.

As a result, the stalemate threshold ρ_i^* increases exponentially over time, even if initial conditions do not favor either combatant. Adaptation to this escalatory dynamic tends to prolong the conflict, as both sides struggle to prevent civilian realignment by outbidding the other's use of coercive force. If no broad gap emerges between the relative costs of cooperation, it becomes more difficult for either combatant to rapidly consolidate civilian support.

3 Appendix O-3: Soviet Counterinsurgency Data

The following section provides summary statistics for the dataset used in the empirical section of the main text. The data are based on declassified incident reports from central, regional and local organs of the NKVD and Communist Party of Ukraine, and collections of OUN-B/UPA documents captured by the Soviets or independently released (see Table 6). The raw data include information on the locations, dates, casualties and tactics used in 17,171 violent events recorded between 1943 and 1955, including 6,190 rebel attacks and 10,981 government operations. 997 of the government events involved NKVD-led (after 1946, MVD and MGB) deportations of individuals and families from their home villages to "special settlements" in Siberia, Northern Russia or other Ukrainian provinces. The remaining government events were more conventional counterinsurgency operations like raids, sweeps, ambushes and pursuits.

The overwhelming majority of government events involved the NKVD and other internal security organs, although various stages of the conflict also saw combat by Soviet partisans, Red Army infantry and counter-intelligence units (i.e. SMERSH, or "Death to Spies"), and local "extermination battalions" comprised of local residents and UPA defectors.

I report summary statistics for three version of this dataset:

1. Panel dataset, which aggregates the events to the level of a rayon (district)-week.[1] Rayons are second-tier administrative units, roughly equivalent to a U.S. county, and are politically relevant as the geographic units of organization of the NKVD's District Departments of Internal Affairs (ROVD). Each rayon contains as few as 2 and as many as 82 villages, with an average of 22.

2. Counterinsurgency dataset (pre-matching), which includes a sample of 5,208 observations in which the Soviets used force at least once in a given rayon-week.

3. Counterinsurgency dataset (post-matching), which includes a sample of 160 pair of treated (resettlement used) and comparison (resettlement not used during counterinsurgency operation) cases, selected from the Counterinsurgency dataset (pre-matching) dataset using propensity score matching.

[1]94.93% of events were geocoded to the village level, 97.96% to the rayon level and 98.65% to the oblast level. The census of 759 rayons was ascertained from official Soviet military maps and annual geographic reference volumes from 1941-1955 (Presidium of Supreme Soviet of USSR, Information-Statistical Division, 1941, 1946, 1954).

Table 6: Main archival data sources

Archive	Abbreviation	Fond	Opis'
Russian State Military Archive	RGVA	38650	1
State Archives of the Russian Federation	GARF	9478c	1
Central State Archive of Public Organizations of Ukraine	TsDAGO	1	3
Central State Archive of Public Organizations of Ukraine	TsDAGO	1	17
Central State Archive of Public Organizations of Ukraine	TsDAGO	1	23
Central State Archive of Public Organizations of Ukraine	TsDAGO	1	24
Central State Archive of Public Organizations of Ukraine	TsDAGO	62	1
Central State Archive of Public Organizations of Ukraine	TsDAGO	62	3
Central State Archive of Public Organizations of Ukraine	TsDAGO	62	22
Central State Archive of Public Organizations of Ukraine	TsDAGO	62	23
Central State Archive of Public Organizations of Ukraine	TsDAGO	62	29

Table 7: Summary Statistics: Panel Dataset.
Unit of analysis: rayon-week. N = 514,602 (759 rayons, 678 weeks).

	Min	Max	Mean	Median	Std.Dev
Resettlement	0	555	0.229	0	8.617
Resettlement (binary)	0	1	0.002	0	0.043
Resettlement (per 1,000)	0	80.417	0.017	0	0.696
Rebel attacks	0	26	0.012	0	0.159
Government operations	0	35	0.021	0	0.347
Neighbors w/ resettlement ops.	0	1	0.002	0	0.029
Number of rural councils	2	82	22.024	21	8.469
Distance to oblast center (km)	0	612	122.672	100	95.748
Wartime partisan control	0	1	0.159	0	0.366
New territory	0	1	0.315	0	0.464
Distance to railroad (km)	0	95	11.756	5	15.088
Year	1943	1955	1949.004	1949	3.739
Month	1	12	6.529	7	3.446

Table 8: SUMMARY STATISTICS: COUNTERINSURGENCY DATASET (PRE-MATCHING).
Unit of analysis: government resettlement/counterinsurgency operation. $N = 5{,}208$.
If more than one operation occurred in a rayon-week, they were collapsed into a single observation.

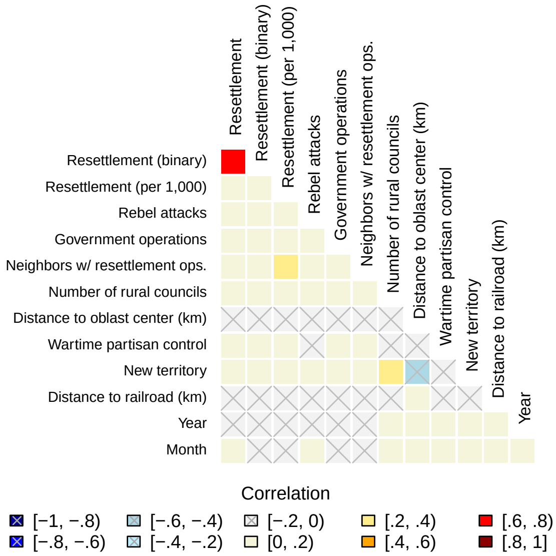
	Min	Max	Mean	Median	Std.Dev
Resettlement	0	536	2.128	0	28.772
Resettlement (binary)	0	1	0.013	0	0.114
Resettlement (per 1,000)	0	80.417	1.710	0	6.702
Rebel attacks	0	6	0.129	0	0.480
Government operations	0	35	0.313	0	1.450
Rebel attacks (post)	0	28	1.558	0	2.559
Rebel attacks (pre)	0	30	1.700	1	2.728
COIN operations (pre)	0	130	5.785	2	11.130
Government selectivity (pre)	0	1	0.438	0	0.471
Rebel selectivity (pre)	0	1	0.204	0	0.352
Rebel selectivity (post)	0	1	0.180	0	0.331
Neighbors w/ resettlement ops.	0	1	0.071	0	0.206
Number of rural councils	7	82	25.563	25	8.070
Distance to oblast center (km)	0	331	61.063	57	37.489
Wartime partisan control	0	1	0.155	0	0.362
New territory	0	1	0.982	1	0.132
Distance to railroad (km)	0	70	6.634	1	11.243
Cropland	0	1	0.825	1	0.380
Year	1943	1955	1947.170	1947	2.228
Month	1	12	6.127	6	3.306

Table 9: SUMMARY STATISTICS: COUNTERINSURGENCY DATASET (POST-MATCHING). Unit of analysis: government resettlement/counterinsurgency operation. $N = 320$.

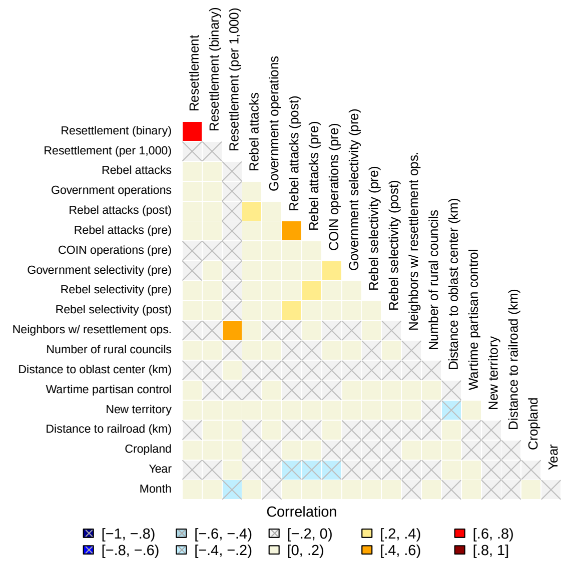
	Min	Max	Mean	Median	Std.Dev
Resettlement	0	224	1	0	13.253
Resettlement (binary)	0	1	0.009	0	0.097
Resettlement (per 1,000)	0	80.417	3.930	0.134	9.350
Rebel attacks	0	4	0.131	0	0.443
Government operations	0	7	0.263	0	0.899
Rebel attacks (post)	0	13	1.384	0	2.180
Rebel attacks (pre)	0	14	1.663	1	2.170
COIN operations (pre)	0	61	5.109	1	9.542
Government selectivity (pre)	0	1	0.375	0	0.458
Rebel selectivity (pre)	0	1	0.233	0	0.375
Rebel selectivity (post)	0	1	0.171	0	0.327
Neighbors w/ resettlement ops.	0	1	0.170	0	0.340
Number of rural councils	7	49	23.891	24	7.615
Distance to oblast center (km)	0	167	54.691	50	34.549
Wartime partisan control	0	1	0.191	0	0.393
New territory	0	1	0.997	1	0.056
Distance to railroad (km)	0	70	5.016	0	9.313
Cropland	0	1	0.797	1	0.403
Year	1944	1953	1946.900	1946	2.109
Month	1	12	5.494	5	3.102

Figure 3: CORRELATION MATRICES.

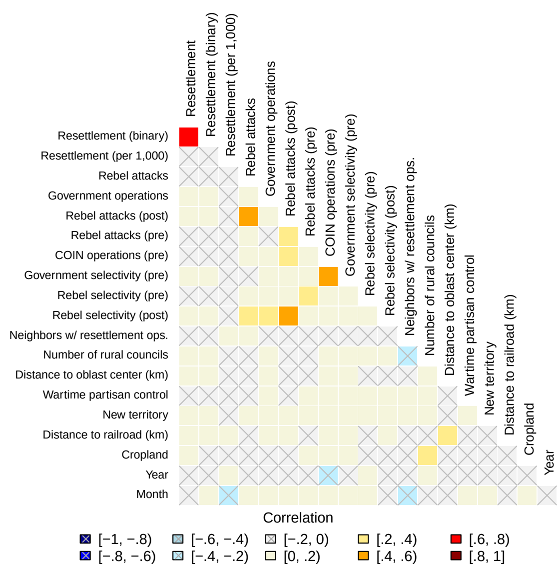
(a) Panel Dataset



(b) Counterinsurgency (pre-matching)



(c) Counterinsurgency (post-matching)



4 Appendix O-4: Regression Tables

The following section reports regression output used for

- Figures 2 (main text) and the propensity score matching model (Appendix Table 10)
- the negative binomial regression models used to calculate incidence rate ratios in Table 3 (main text) (Appendix Table 12)
- expected values in Figure 3 (main text) (Appendix Table 12)
- expected values in Figure 3 (main text), replicated with absolute, rather than proportional levels of resettlement (Appendix Table 13)

Table 10: Determinants of Resettlement. Model 1 was used as the propensity score model in the main text, and generated the predicted probabilities shown in Figure 2b and 2c (main text). Model 2 generated the predicted probabilities shown in Figure 2a (main text).

	Propensity Score Model	
	Model 1	Model 2
	GAM Logit	GAM Logit
Strategy (pre-treatment)		
Government selectivity (θ_G)	-0.70213***	.
	(0.1321)	
Rebel selectivity (θ_R)	0.44195**	.
	(0.1481)	
Government punishment (ρ_G)	-0.04821***	.
	(0.0084)	
Rebel punishment (ρ_R)	0.09398***	.
	(0.0167)	
Selective violence ratio ($\frac{\theta_G \rho_G}{\theta_R \rho_R}$)	.	-0.66308***
		(0.0707)
Resettlement in neighboring rayons	11.04089***	10.94174***
	(0.5086)	(0.4968)
Mobilizational capacity		
Number of rural councils	-0.00965	-0.01249*
	(0.0071)	(0.007)
Distance to oblast capital	0.00341*	0.0027*
	(0.0015)	(0.0015)
Partisan control in WWII	-0.34496*	-0.32155*
	(0.1666)	(0.1639)
New territory	3.16742**	2.98136**
	(1.0913)	(1.0817)
Distance to railroad	0.02376**	0.02361**
	(0.0096)	(0.0095)
Distance to railroad^2	-0.00034	-0.00036*
	(2e-04)	(2e-04)
Economic		
Crop land	0.39818**	0.45399**
	(0.156)	(0.1534)
Time		
Year	-0.07701**	-0.05637*
	(0.0261)	(0.0246)
Month	$EDF: 8.798$	$EDF: 8.786$
	$\chi^2: 96.81$***	$\chi^2: 85.99$***
(Intercept)	144.15142**	104.13492*
	(50.8817)	(47.8448)
N	5208	5208
AIC	2719.268	2773.729
AUC	0.903	0.899

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Figure 4: Mobilizational capacity and other determinants of resettlement. Solid lines are the means of 10,000 simulations, based on Model 1. Dashed lines are 95% confidence intervals.

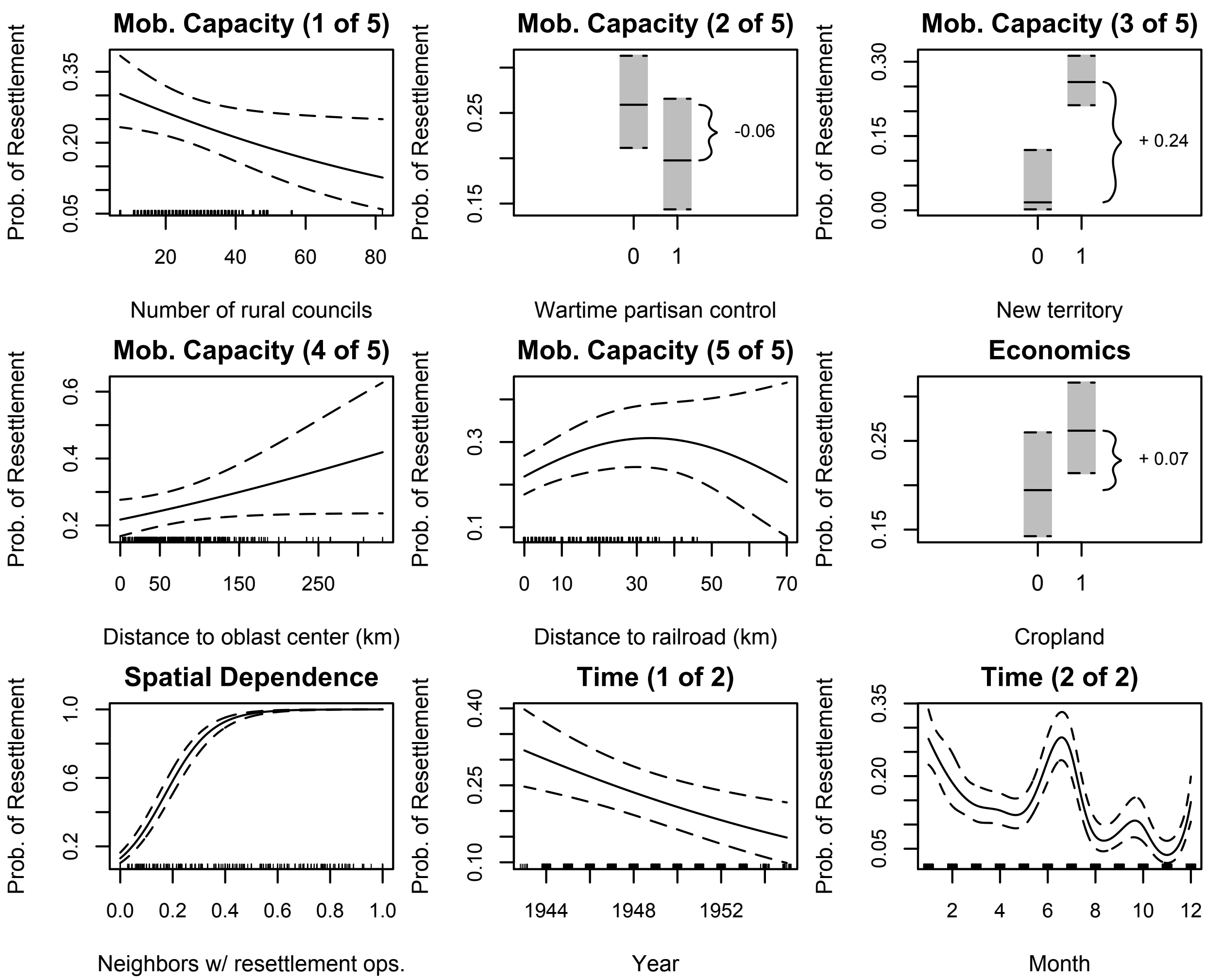


Table 11: Effect of Resettlement on Rebel Violence. Models 5 and 6 were used to calculate incidence rate ratios in Table 3 (main text). Models 3 and 4 fit the same specification using the pre-matching dataset of counterinsurgency operations, and are presented here for comparison.

	Pre-Matching		Post-Matching	
	Model 3	Model 4	**Model 5**	**Model 6**
	NegBin	NegBin	NegBin	NegBin
Resettlement	-0.18146**	-0.48677***	-0.49281**	-0.63392***
	(0.059)	(0.0559)	(0.1937)	(0.1845)
Strategy (pre-treatment)				
Government punishment (ρ_G)	.	-0.00031	.	0.01846*
		(0.0018)		(0.0102)
Rebel punishment (ρ_R)	.	0.12649***	.	0.2205***
		(0.0067)		(0.0429)
Government selectivity (θ_G)	.	0.20289***	.	-0.14306
		(0.0465)		(0.223)
Rebel selectivity (θ_R)	.	-0.11329*	.	-0.59074*
		(0.058)		(0.2809)
Mobilizational capacity				
Number of rural councils	.	-0.00542*	.	-0.00093
		(0.0026)		(0.0125)
Distance to oblast capital	.	-0.00286***	.	-0.00263
		(6e-04)		(0.0028)
Partisan control in WWII	.	0.00411	.	0.0367
		(0.0564)		(0.238)
New territory	.	2.518***	.	15.96514
		(0.4366)		(3305.4988)
Distance to railroad	.	-0.0084*	.	0.01482
		(0.0038)		(0.021)
Distance to railroad^2	.	0.00021**	.	-0.00016
		(1e-04)		(5e-04)
Economic				
Crop land	.	-0.23939***	.	-0.41354*
		(0.0535)		(0.2271)
Time				
Year	.	-0.25198***	.	-0.22159***
		(0.0112)		(0.0491)
Month	.	-0.01409*	.	-0.01514
		(0.0063)		(0.0306)
(Intercept)	0.47461***	488.74452***	0.5416***	416.08682
	(0.0248)	(21.7361)	(0.1327)	(3306.8835)
N	5208	5208	320	320
AIC	17423.244	16178.323	1003.9	979.019

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 12: Scale of Resettlement and Rebel Violence. Model 8 was used to calculate expected values for Figure 3.a (main text). Model 10 was used to calculate expected values for Figure 3.b (main text). Models 7 and 9 are presented for comparison.

	DV: Rebel violence (ρ_R) (post-treatment)		DV: Rebel selectivity (θ_R) (post-treatment)	
	Model 7 NegBin	**Model 8** NegBin	Model 9 NegBin	**Model 10** NegBin
Civilians resettled (per 1,000)	-0.03218***	-0.01453**	-0.02928**	-0.02237*
	(0.0055)	(0.0051)	(0.01)	(0.01)
Strategy				
Rebel selectivity (θ_R)	.	-0.09051	.	0.59882**
		(0.1571)		(0.2466)
Government selectivity (θ_G)	.	0.50574***	.	0.56415**
		(0.1463)		(0.2401)
Rebel punishment (ρ_R)	.	0.1582***	.	0.05507*
		(0.015)		(0.0236)
Government punishment (ρ_G)	.	0.01903**	.	-0.00321
		(0.0075)		(0.0128)
Mobilizational capacity				
Distance to oblast capital	.	-0.00353*	.	0.00036
		(0.0017)		(0.0028)
Number of rural councils	.	-0.00104	.	0.00036
		(0.0074)		(0.0125)
Partisan control in WWII	.	0.03537	.	-0.1176
		(0.168)		(0.2909)
Distance to railroad	.	-0.01383	.	0.02303
		(0.0109)		(0.0262)
Distance to railroad^2	.	0.00025	.	-9e-04
		(2e-04)		(8e-04)
Economic				
Crop land	.	-0.00419	.	-0.46936*
		(0.1715)		(0.2657)
(Intercept)	0.52251***	-0.13433	-1.63398***	-1.80333***
	(0.0765)	(0.2584)	(0.1144)	(0.4235)
N	957	957	957	957
AIC	2824.499	2690.874	749.925	742.993

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 13: Scale of Resettlement and Rebel Violence/Selectivity (absolute numbers). Models 11-14 replicate the analyses in Table 12, with absolute numbers of people resettled rather than proportions.

	DV: Rebel violence (ρ_R) (post-treatment)		DV: Rebel selectivity (θ_R) (post-treatment)	
	Model 11 NegBin	Model 12 NegBin	Model 13 NegBin	Model 14 NegBin
Civilians resettled (absolute)	-0.00213***	-0.00083*	-0.0018**	-0.00124*
	(4e-04)	(4e-04)	(7e-04)	(7e-04)
Strategy				
Rebel selectivity (θ_R)	.	-0.07692	.	0.45524*
		(0.1576)		(0.2499)
Government selectivity (θ_G)	.	0.5164***	.	0.52274*
		(0.1467)		(0.2404)
Rebel punishment (ρ_R)	.	0.16208***	.	0.05597**
		(0.015)		(0.0234)
Government punishment (ρ_G)	.	0.01924**	.	0.0061
		(0.0076)		(0.012)
Mobilizational capacity				
Distance to oblast capital	.	-0.00334*	.	0.00024
		(0.0017)		(0.0028)
Number of rural councils	.	0.00088	.	-0.01121
		(0.0075)		(0.013)
Partisan control in WWII	.	0.04122	.	-0.22912
		(0.1685)		(0.3023)
Distance to railroad	.	-0.0167	.	0.01632
		(0.0109)		(0.0249)
Distance to railroad^2	.	3e-04	.	-0.00074
		(2e-04)		(8e-04)
Economic				
Crop land	.	-0.01304	.	-0.48467*
		(0.1718)		(0.2631)
(Intercept)	0.51137***	-0.2153	-1.65569***	-1.4784***
	(0.0794)	(0.2556)	(0.1167)	(0.4124)
N	957	957	957	957
AIC	2835.322	2694.766	757.407	749.504

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

5 Appendix O-5: Mobilizational Capacity Index

The results presented in the main text estimated the impact of mobilizational capacity on resettlement by considering the individual effects of several political and geographic characteristics (e.g. number of rural councils, etc.). In the following section, I present additional analyses, which reduce this dimensionality by employing a bivariate *mobilizational capacity index*.

Table 14 reports loadings for a two-factor model, using six indicators of mobilizational capacity: partisan control in WWII, new territory, urban area, industrial production, road accessibility, industrial production and electrification. The variable selection and number of factors were determined through a series of goodness of fit tests, and visual inspection of scree plots. Factor 1 is orthogonal to new territory, but has a strong positive relationship with urbanization, industrial production and accessibility by road. A one standard deviation increase in this factor increases these variables by 0.595, 0.692 and 0.671, respectively. The second factor, meanwhile, is less prevalent in the new territories the USSR annexed from Poland in 1939, and more prevalent in area of WWII-era Soviet partisan control – although the latter relationship is weaker. The remaining variables – industrial production, road accessibility and electrification – also project weakly onto the positive dimension of this factor. Based on the directions and strengths of these relationships, we will call the first factor "economic development" and the second "entrenched Soviet power." We could expect both factors to be more prevalent where mobilizational capacity is high.

As Figure 5 shows, the first factor ("economic development") distinguishes between logistically accessible urban areas that specialize in the industrial production of capital goods (right), from less-industrialized, inaccessible rural areas (left). The second factor ("entrenched Soviet power") most distinguishes newly-acquired territories with limited historical Soviet presence (down), from older territories, some of which were controlled by Red partisans during WWII (up). Mobilizational capacity should be weakest – and resettlement most common – in rayons closer to the lower-left corner. We should expect mobilizational capacity to be greatest – and resettlement least common – in rayons closer to the upper-right corner.

A map of each factor is shown in Figure 6. The maps suggest that the first factor is less geographically concentrated than the second. "Economic development" is strong in the urban industrial centers of East Ukraine, but high values also appear around the larger cities in Ukraine's West. "Entrenched Soviet power," meanwhile, has a strong east-west dimension, with higher values closer to the Russian border.

Do these two factors have the expected impact on resettlement? Figure 7 Table 15 report the results of first-stage propensity score models, re-estimated with the two sets of factor scores as explanatory variables. As predicted, both factors have a strong, negative impact on the probability of resettlement.

If we replicate the matching analysis using the propensity score model in Table 15, Model 15, the result remain essentially the same as before. Table 16 reports balance statistics before and after the new matching. While the balance is not quite as strong as in the propensity score model employed in the main text – particularly on the two factors and the time variables – it exceeds all standards of variance on all other variables. The matched sample includes 148 treatment and 148 comparison cases. The difference-in-difference and regression results from the new matched sample are reported in Tables 17 and 18. Both sets of results confirm our previous findings: resettlement has a strong negative effect on future rebel activity.

Table 14: Factor loadings.

	Factor 1 "Economic development"	Factor 2 "Old Soviet power"
Partisan control in WWII		0.204
New territory		-0.458
Urban area	0.595	-0.168
Industrial production	0.692	0.120
Road accessibility	0.671	0.171
Electrification	0.166	0.154
Correlations		
Factor 1	1	0.178
Factor 2	0.178	1

χ^2=4.17, df=4, p=.383

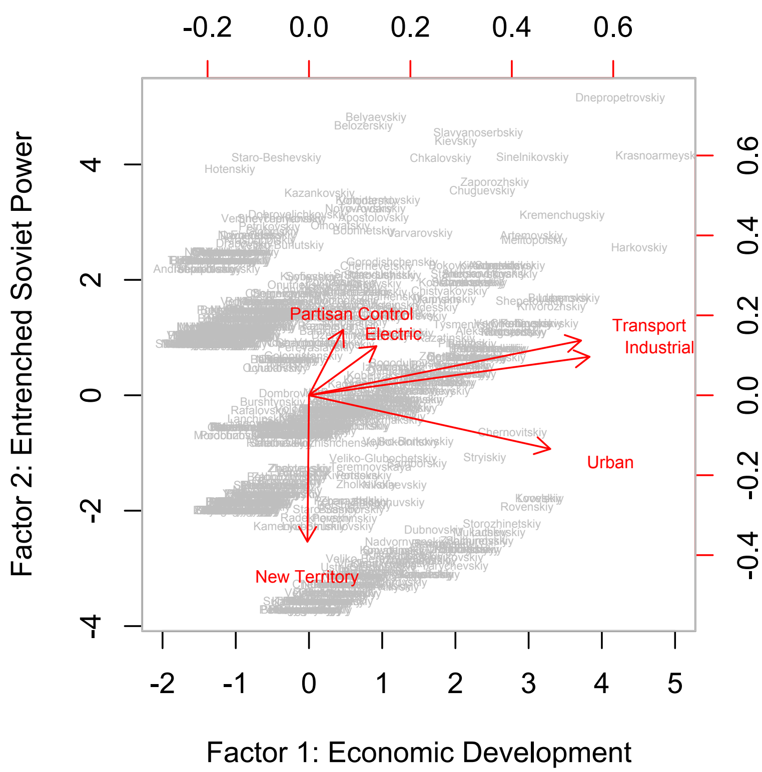
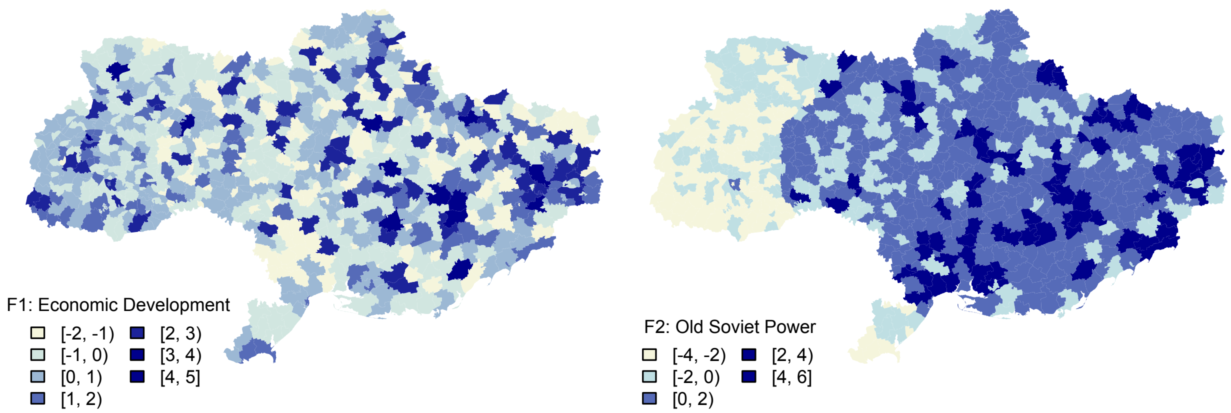


Figure 5: Mobilizational capacity index



(a) Factor 1 (b) Factor 2

Figure 6: Geographic distribution of factors.

Figure 7: Mobilizational capacity index and Resettlement.

(a) Factor 1 (b) Factor 2

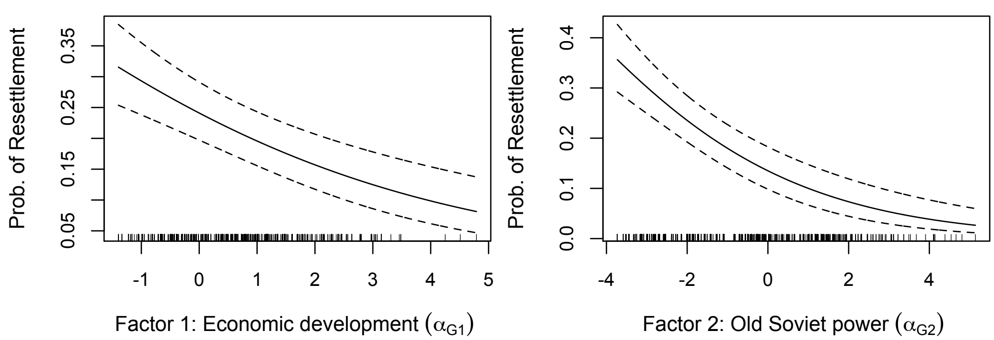


Table 15: Mobilizational capacity index and Resettlement.

	Propensity Score Model	
	Model 15	Model 16
	GAM Logit	GAM Logit
(Intercept)	171.51649***	124.37837**
	(50.7497)	(47.7142)
Strategy (pre-treatment)		
Government punishment (ρ_G)	-0.052***	.
	(0.0085)	
Rebel punishment (ρ_R)	0.0942***	.
	(0.0167)	
Government selectivity (θ_G)	-0.72858***	.
	(0.1314)	
Rebel selectivity (θ_R)	0.46394***	.
	(0.1471)	
Selective violence ratio ($\frac{\theta_G \rho_G}{\theta_R \rho_R}$)	.	-0.70671***
		(0.0703)
Resettlement in neighboring rayons	11.43663***	11.31373***
	(0.5245)	(0.513)
Mobilizational capacity (α_G)		
Factor 1: Economic development	-0.27435***	-0.25483***
	(0.0578)	(0.0569)
Factor 2: Old Soviet power	-0.35014***	-0.31961***
	(0.056)	(0.0547)
Time		
Year	-0.08966***	-0.06546**
	(0.0261)	(0.0245)
Month	EDF : 8.798	EDF : 8.786
	χ^2 : 96.81***	χ^2 : 85.99***
N	5208	5208
AIC	2699.577	2759.058

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table 16: Balance statistics for propensity score matching.

Variable	Mean T	Mean C	Std. Bias	T Test	KS Test
Pre-matching. $N = 5208$ $(T: 957, C: 4251)$					
Govt violence (pre-treatment)	3.286	6.347	-0.393	-9.91***	0.25***
Rebel violence (pre-treatment)	2.226	1.582	0.186	5.44***	0.1***
Govt selectivity (pre-treatment)	0.282	0.473	-0.444	-12.16***	0.2***
Rebel selectivity (pre-treatment)	0.231	0.198	0.089	2.52*	0.05
Resettlement in neighboring rayons (spatial lag)	0.357	0.007	1.024	31.6***	0.63***
Factor 1: Economic development	0.198	0.197	0.001	0.03	0.02
Factor 2: Old Soviet power	-2.278	-2.210	-0.069	-1.91	0.04
Year	1946.912	1947.227	-0.138	-3.88***	0.15***
Month	4.865	6.412	-0.515	-14.13***	0.25***
Post-matching. $N = 296$ $(T: 148, C: 148)$					
Variable	Mean T	Mean C	Std. Bias	T Test	KS Test
Govt violence (pre-treatment)	2.628	3.318	-0.112	-1.12	0.15
Rebel violence (pre-treatment)	1.500	1.365	0.063	0.55	0.08
Govt selectivity (pre-treatment)	0.290	0.295	-0.012	-0.13	0.04
Rebel selectivity (pre-treatment)	0.214	0.158	0.153	1.42	0.08
Resettlement in neighboring rayons (spatial lag)	0.213	0.218	-0.012	-1.62	0.05
Factor 1: Economic development	-0.030	0.065	-0.088	-0.85	0.23***
Factor 2: Old Soviet power	-2.334	-2.522	0.204	1.68	0.2**
Year	1947.291	1946.899	0.176	1.61	0.17*
Month	4.649	5.169	-0.170	-1.99*	0.21**

$^{*}p < .05, ^{**}p < .01, ^{***}p < .001$

Table 17: Difference-in-difference results, mobilizational capacity index. $E[Y_t]$ is the average number of rebel attacks observed in the 12 weeks before ($t = 0$) and after ($t = 1$) a counterinsurgency operation. Estimates based on the matched sample of 160 pairs.

Quantity	No resettlement	Resettlement	Diff-in-Diff
$E[Y_{t=0}]$	1.36	1.50	0.14
$E[Y_{t=1}]$	1.38	0.94	-0.44
$E[Y_{t=1} - Y_{t=0}]$	0.01	-0.56	-0.57
Percent change	0.99%	-37.39%	-38.38%

Table 18: Incidence rate ratios from negative binomial regression, mobilizational capacity index. An incidence rate ratio ($\frac{E[Y|D=1]}{E[Y|D=0]}$) compares the expected number of rebel attacks following counterinsurgency operations with ($D = 1$) and without ($D = 0$) resettlement. A ratio of 0.63 means that localities exposed to resettlement will experience 0.63 times the rebel violence of those not exposed.

Quantity	Resettlement only	Including all variables
Incidence rate ratio	0.61 (0.42, 0.89)	0.53 (0.37, 0.76)
Percent change	-38.91% (-58.21%, -10.69%)	-46.95% (-63.05%, -23.84%)
N	320	320
AIC	1003.9	979.02

6 Appendix O-6: Sensitivity Analysis

As with any empirical analysis, the findings presented in the main text need to be treated with some caution. The following section reports the results of robustness checks that address three potential substantive and methodological concerns. First is the size of the treatment window (currently 12 weeks before and after resettlement). Second is the type of matching estimator used (currently propensity scores with caliper). Third is the robustness of these results to other (non-matching) estimators of average treatment effects.

Alternative treatment windows

My choice of a 12 week treatment window is motivated by two considerations: (1) the time needed to authorize, plan and implement a resettlement operation, and (2) the need to capture both immediate retaliatory attacks and any longer-term impact on rebel strategy, mobilization and fighting capacity. As such, this choice is well supported by the archival record.

Most resettlements required authorization from the Main Directorate of the NKVD/MVD Internal Forces in Moscow, which received situation reports from the field every two weeks. The resource-intensity and logistical complexity of such operations necessitated between a one and six-week lag between authorization and implementation. Large-scale resettlements typically required temporary duty orders for all essential personnel for a period of up to one month, including the deployment, execution and escort phases of each mission. More routine resettlements of individual households could be implemented on shorter notice at the level of a squad or platoon. Given the range of operational requirements, we can assume that the NKVD carried out resettlements in response to events as recent as one week old and as distant as two-three months old.[2]

As regards the size of the window following treatment, Proposition 3 predicts that resettlement is generally accompanied by an increase in rebel violence, which – as Proposition 2 claims – should also subside over time as the rebel population dwindles in size. A shorter time window may yield the impression that the resettlement effect is inflammatory rather than suppressive. The twelve-week window avoids this problem, while not being so long as to substantially increase the risk of post-treatment bias from subsequent intervening events.

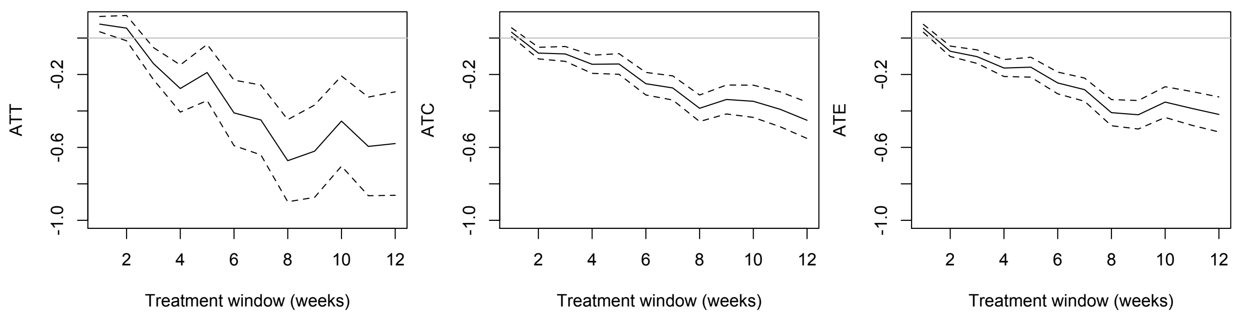
To ensure that my results are not overly dependent on treatment window size, however, I conducted a series of robustness checks. Figure 8 shows that the direction and statistical significance of the "resettlement effect" is not an artifact of the 12 week window used in the preceding analysis. Three types of estimators are provided for every treatment window from one week to twelve. The first is the average treatment effect on the treated (ATT) – the same quantity reported earlier.[3] The second is the average treatment effect on the untreated (ATC), or the average impact of resettlements in cases where resettlement was unlikely to be used.[4] These were generally cases where such methods were not needed due to more robust territorial control or more abundant external resources. The third estimator is the overall average treatment effect (ATE).[5]

For every treatment window larger than six weeks, the ATT estimate was negative and highly significant – reiterating the results already reported in the previous section. This pattern was also evident for the other two estimators, for all windows save one week. Consistent with Proposition

[2]GARF, F. 9479, Op. 1, D. 62, L. 72-73.
[3]Formally, $ATT = E[Y_{t=1}|D = 1] - E[Y_{t=0}|D = 1]$
[4]Formally, $ATC = E[Y_{t=1}|D = 0] - E[Y_{t=0}|D = 0]$
[5]Formally, $ATE = E[Y_{t=1}|D = 1] - E[Y_{t=0}|D = 0]$

Figure 8: Treatment effect estimates with alternative treatment windows.

(a) ATT (b) ATC (c) ATE



3.5, these results suggest that the short-term suppressive effect of resettlement may be dampened by a spike in rebel attacks immediately following resettlement. As predicted by Proposition 2, however, the overall negative pattern asserts itself after the sixth week. The ATC results suggest that resettlement is a reliable tool of pacification even when introduced into a situation where it not traditionally used. Since resettlement is most likely to be used in "hard cases" where coercive measures fall short due to deficiencies in information, this finding is not altogether surprising.

Alternative matching methods

As is widely recognized, but rarely addressed in practice, reliance on a single matching method can often yield problematic inferences. For instance, King et al. (2011) show that the use of propensity scores with calipers (as the preceding study has done) can in some instances approximate random matching and lead to worse imbalance. I initially selected the propensity score method for two reasons. First, the two-step procedure most directly reflected a unified theoretical narrative about why governments choose to use resettlement, and whether resettlement works as governments intend. Second, the method's relative simplicity enabled an ease of interpretation beyond what was offered by most alternatives.

The current section offers a summary of ATT estimates using an ensemble of matching techniques, including propensity scores, Mahalanobis distance, and genetic matching. Variables used for matching include the same set of observable pre-treatment covariates used in the main text. I present several matching solutions with each metric. Propensity score and Mahalanobis techniques were implemented with and without calipers. Following Sekhon (2011), I implemented the genetic matching algorithm with and without a nested propensity score model.[6] I also present Mahalanobis and genetic results with exact matching on *new territory*, *crop land*, *wartime partisan control*, and *year*. These permutations yield ten unique matching solutions.

Table 3 reports ATTs estimated using these alternative matching methods. All estimates are in line with previous results. The average treatment effect of resettlement on the treated is consistently negative and statistically significant. Mahalanobis distance (with caliper and exact matching) yields the greatest improvement in balance, at 95 percent, at the cost of a relatively small sample size of 143 pairs. Simple propensity scores and genetic matching produced the most modest balance improvements, at 63 percent, albeit with a much larger number of matched pairs. The solution pre-

[6]The population size for the genetic search algorithm was 100, with 10 generations each.

Table 19: ATT ESTIMATED WITH ALTERNATIVE MATCHING METHODS. Standardized difference in means (SDM) prior to matching: 0.280.

Method	ATT	Lower	Upper	Pairs	SDM	Improvement
Propensity score	-0.579	-0.863	-0.295	957	0.103	63.217 %
Propensity score (caliper)	-0.625	-1.120	-0.130	160	0.063	77.486 %
Mahalanobis	-0.280	-0.436	-0.125	957	0.067	75.997 %
Mahalanobis (exact)	-0.235	-0.383	-0.088	956	0.093	66.848 %
Mahalanobis (caliper)	-0.343	-0.647	-0.039	145	0.013	95.229 %
Mahalanobis (caliper, exact)	-0.343	-0.647	-0.039	145	0.013	95.229 %
Genetic	-0.378	-0.567	-0.189	965	0.086	69.222 %
Genetic (exact)	-0.340	-0.485	-0.195	980	0.104	63.017 %
Genetic (propensity scores)	-0.353	-0.543	-0.163	967	0.077	72.615 %
Genetic (p. scores, exact)	-0.335	-0.495	-0.174	974	0.103	63.316 %

sented in the paper (propensity scores with caliper) offers a well-balanced middle ground between these extremes, with strong improvement in balance (77 percent) and a sample size of 160 pairs. In sum, although the size of the effect may vary across matching estimators, the overall nature of the result does not: resettlement suppresses rebel violence.

Alternative treatment effect estimators

A central assumption behind the matching estimator presented in the main text is that treatment assignment (i.e. use vs. non-use of resettlement) is independent of potential outcomes (i.e. future rebel activity), conditional on observed pre-treatment covariates (i.e. selectivity, mobilizational capacity). Yet if the conditional independence assumption is violated, and selection into treatment is on the basis of unobserved variables, the matching estimator will be biased. To address such concerns, the current section provides a series of additional treatment effect estimates under different sets of assumptions, which rely on neither conditional independence, nor exclusion restrictions.

I provide a total of six additional estimates of the average treatment effect (ATE), the average treatment effect on the treated (ATT), and the average treatment effect on the untreated (ATC): (1) ordinary least squares, (2) Heckman's two-step estimator, (3) Hirano and Imbens' inverse probability weighted estimator, (4) Millimet and Tchernis' minimum-biased estimator, (5) the control function approach, and (6) Klein and Vella' estimator. I summarize the basic intuition behind these estimators below. A more thorough discussion is provided in Millimet and Tchernis (2012); Heckman (1976, 1979); Heckman, LaLonde and Smith (1999); Heckman and Navarro-Lozano (2004); Hirano and Imbens (2001).

1. **Ordinary least squares (OLS)**. Presented here for comparison only, the "naive" OLS estimator is obtained through the expression

$$Y = D\beta + \gamma X + \epsilon \tag{36}$$

where Y is the outcome vector, D is the treatment assignment vector, X is the matrix of pre-treatment covariates, β is the treatment effect, γ a vector of coefficients for X, and ϵ is an i.i.d. error term. If we let

$$M_1 = I - D(D'D)^{-1}D' \tag{37}$$
$$M_2 = I - X(X'X)^{-1}X' \tag{38}$$

where M_1 and M_2 are symmetric and idempotent, then the treatment effect β and coefficients γ can be estimated as

$$ATE = \hat{\beta} = (D'M_2D)^{-1}(D'M_2Y) \tag{39}$$
$$\hat{\gamma} = (X'M_1X)^{-1}(X'M_1Y) \tag{40}$$

2. **Heckman 2-step**. Heckman's selection model (Heckman, 1976, 1979) first estimates the probability of treatment using a probit model,

$$P(D = 1|X) = \Phi(X\gamma) \tag{41}$$

where Φ is the Cumulative Distribution Function of the standard normal distribution. In the second stage, this approach uses OLS to estimate the following equation

$$Y = X\beta_0 + XD(\beta_1 - \beta_0) + \beta_{\lambda 0}(1 - D)\left(\frac{\phi(X\gamma)}{1 - \Phi(X\gamma)}\right) + \beta_{\lambda 1}D\left(\frac{-\phi(X\gamma)}{\Phi(X\gamma)}\right) + u \tag{42}$$

The ATE estimate is then $ATE = \bar{X}(\hat{\beta}_1 - \hat{\beta}_0)$

3. **Inverse probability weighting**. The normalized inverse probability weighted estimate (Hirano and Imbens, 2001) is given by

$$ATE = \frac{\sum_i \frac{Y_i D_i}{P(D_i=1|X_i)}}{\sum_i \frac{D_i}{P(D_i=1|X_i)}} - \frac{\sum_i \frac{Y_i(1-D_i)}{P(D_i=0|X_i)}}{\sum_i \frac{(1-D_i)}{P(D_i=0|X_i)}} \tag{43}$$

where the propensity score for each observation i, $P(D_i = 1|X_i)$ is obtained through probit.

4. **Minimum-biased estimator**. The estimator developed by Millimet and Tchernis (2012) takes a similar form to the IPW, with a restricted sample:

$$ATE = \frac{\sum_{i\in\Omega} \frac{Y_i D_i}{P(D_i=1|X_i)}}{\sum_{i\in\Omega} \frac{D_i}{P(D_i=1|X_i)}} - \frac{\sum_{i\in\Omega} \frac{Y_i(1-D_i)}{P(D_i=0|X_i)}}{\sum_{i\in\Omega} \frac{(1-D_i)}{P(D_i=0|X_i)}} \tag{44}$$

where the Ω denotes a neighborhood of observations with a propensity score $P(D_i = 1|X_i)$ within a specific interval.

5. **Control function**. The control function approach (Heckman, LaLonde and Smith, 1999; Heckman and Navarro-Lozano, 2004) is a generalization of Heckman's selection model, which seeks to eliminate correlation between treatment assignment and the error term ϵ, by approximating $E[\epsilon|X, D = d]$ with a polynomial in $P(D = 1|X)$:

$$\begin{aligned} Y =& (\alpha_0 + \pi_{00})(1 - D) + (\alpha_1 + \pi_{10})(D) + X\beta_0 + XD(\beta_1 - \beta_0) \\ &+ \sum_s^S \pi_{0s}(1 - D)P(D = 1|X)^s + \sum_s^S \pi_{1s}DP(D = 1|X)^s + u \end{aligned} \tag{45}$$

where S is the order of the polynomial term. The ATE estimate is then

$$ATE = (\hat{\alpha}_1 - \hat{\alpha}_0) + \bar{X}(\hat{\beta}_1 - \hat{\beta}_0) \tag{46}$$

6. **Klein and Vella**. As implemented by McCarthy, Millimet and Tchernis (2013), the Klein and Vella (2009) estimator models the probability of treatment as

$$P(D = 1) = \Phi\left(\frac{X\gamma}{e^{X\delta}}\right) \tag{47}$$

and estimates the parameters of the treatment selection model through maximum likelihood

$$\ln L = \sum_i \left(\ln\Phi\left(\frac{X\gamma}{e^{X\delta}}\right)\right)^{D_i}\left(\ln\left(1 - \Phi\left(\frac{X\gamma}{e^{X\delta}}\right)\right)\right)^{1-D_i} \tag{48}$$

where the intercept term in δ is normalized to zero for identification. The ML-based predicted probabilities of treatment $\hat{P}(D = 1)$ are then used as an instrument in (42).

The ATE, ATT and ATC estimates for estimators 1, 3, 4, 5 and 6 are reported in Table 20. The Heckman 2-step results are reported in Table 21. These additional results confirm the previous findings: resettlement has a stong, negative effect on future rebel activity (Proposition 2). The Heckman first-stage results further confirm that resettlement is most likely to occur where the government has a selectivity disadvantage, and where mobilizational capacity is limited (Proposition 3).

Table 20: Alternative treatment effect estimators. Point estimates reported. 95% confidence intervals shown in parentheses.

Estimator	ATE	ATT	ATU
Ordinary least squares	-0.455 (-0.587, -0.316)	-0.455 (-0.587, -0.316)	-0.455 (-0.587, -0.316)
Inverse-probability weight	-0.253 (-0.389, -0.111)	-0.548 (-0.729, -0.366)	-0.186 (-0.335, -0.366)
Minimum-biased	-1.742 (-2.066, 0.729)	-1.733 (-2.838, -0.727)	-1.612 (-2.317, -0.610)
Control function	-20.742 (-60.047, -3.669)	-22.340 (-40.040, -8.962)	-20.382 (-67.676, -0.967)
Klein-Vella	-2.029 (-2.821, -0.928)	-2.029 (-2.821, -0.928)	-2.029 (-2.821, -0.928)

Table 21: Heckman treatment effect estimator.

	Second stage Y Rebel activity	First stage $P(D=1\|X)$ Resettlement
Resettlement	-0.554***	
	(0.120)	
Strategy (pre-treatment)		
Government selectivity (θ_G)	0.176**	-0.413***
	(0.0740)	(0.0644)
Rebel selectivity (θ_R)	-0.751***	0.224***
	(0.0943)	(0.0754)
Government punishment (ρ_G)	0.0143***	-0.0148***
	(0.00305)	(0.00359)
Rebel punishment (ρ_R)	0.430***	0.0486***
	(0.0123)	(0.00898)
Resettlement in neighboring rayons		5.581***
		(0.193)
Mobilizational capacity		
Distance to railroad	-0.0188***	0.0105**
	(0.00618)	(0.00483)
Distance to railroad^2	0.000487***	-0.000113
	(0.000140)	(0.000107)
Distance to oblast capital	-0.00428***	0.00161**
	(0.000894)	(0.000763)
Number of rural councils	-0.00253	-0.00368
	(0.00401)	(0.00349)
New territory	0.474*	1.327***
	(0.254)	(0.410)
Partisan control in WWII	-0.120	-0.177**
	(0.0884)	(0.0803)
Economic		
Crop land	-0.00582	0.236***
	(0.0843)	(0.0752)
Constant	0.849***	-2.833***
	(0.305)	(0.434)
Observations	5,208	
$SE(\lambda)$	0.0843	
λ	0.0955	
σ	2.251	
ρ	0.0424	

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

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