

The Wages of Repression *

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Abstract

Incidents of government repression often share a common aim, preventing opposition mobilization, but vary in who is targeted, sometimes resulting in surprisingly widespread repression. Building on a conceptual distinction between targeted repression (against opposition group members) and mass repression (against citizens broadly), I develop a framework that shows autocrats may benefit from using both types of repression in combination to prevent opposition against the regime. Targeted and mass repression have distinct effects on civilians' incentives to join an opposition. Targeted repression decreases benefits of challenging the regime, activating citizens' security concerns. Mass repression affects individuals' material well-being, improving opportunities for participants in the economy. These participation and material well-being mechanisms make targeted and mass repression jointly optimal for the regime. The distinct logics of targeted and mass repression can make them complements, meaning the regime prevents the emergence of opposition groups by employing more of both types of repression simultaneously.

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Autocratic regimes regularly engage in campaigns of repression to confront not just organized opposition movements, but also nebulously defined threats. To illustrate, in May 2005, the Mugabe regime in Zimbabwe initiated a massive slum-clearing effort, Operation Murambatsvina, that displaced approximately 570,000 individuals and destroyed 32,500 businesses.¹ The regime’s targets were urban dwellers, living in unauthorized housing structures and operating black-market businesses, who were not an immediate threat to Mugabe’s rule. Even regime opponents described the crackdown as an effort to deter potential unrest among an as-yet unorganized group.² Despite the scope and devastating humanitarian consequences of the operation, the regime faced no meaningful challenges in response.³ Instead, Operation Murambatsvina was perceived to deter potential opposition mobilization. This incident raises two interrelated questions: First, why do regimes carry out far-reaching campaigns of preventive repression? Second, does this preventive repression support autocrats’ hold on power? Answering these questions is key for understanding autocratic regime stability, and important for policymakers interested in safeguarding human rights.

Autocrats rely on an array of repressive tactics to confront internal challenges. Day-to-day social and political lives in these states are often shaped by repression, like media censorship and restrictions on political organizations (Egorov, Guriev and Sonin, 2009; Gehlbach, Sonin and Svobik, 2016). Such regular civil liberties violations, and selective targeting of identifiable opposition figures, are intended to deter opposition mobilization (Pierskalla, 2010). Intense episodes of preventive repression are a significant departure from this everyday repression and can appear to be unprompted. If threats to the regime arise, leaders predictably escalate repression in response (Davenport, 2007*a*). In the absence of

¹Estimates from the Report of the Fact-Finding Mission to Zimbabwe to assess the Scope and Impact of Operation Murambatsvina by the UN Special Envoy on Human Settlements in Zimbabwe (Tibaijuka, 2005).

²As reported to Human Rights Watch (Human Rights Watch, 2005*a*).

³See “Policing the State: An evaluation of 1,981 political arrests in Zimbabwe 2000-2005” by the Institute of Justice and Reconciliation and the Solidarity Peace Trust.

broad-based opposition, repression that is broad in scope and scale seems to carry significant risk without obvious reward. How can we understand mass repression that seems to be without cause?

An explanation perhaps seems obvious—regimes expand the scope of their regular repressive efforts if they believe such repression is necessary to prevent opposition mobilization (Ritter and Conrad, 2016). But incidents of repression like Operation Murambatsvina are theoretically puzzling because they conform neither to expectations around preventive repression nor indiscriminate repression. This visible escalation should represent a failure of preventive repression (Dragu and Przeworski, 2019) and generate costly backlash against the regime’s use of force (Kalyvas, 2006, 171). Yet, regimes are known to be strategic in their use of repression (Di Lonardo, Sun and Tyson, 2020; Svobik, 2013). This begs the question; can this repression support the regime’s hold on power? I develop a model that rationalizes preventive mass repression and does so without leading to increases in opposition mobilization.

In my framework, an autocratic regime chooses both the scope and scale of its preventive repression. The primary dimension on which types of repression vary is the politico-social characteristics of the regime’s targets. What matters is whether repression is employed only against identifiable members of an opposition group or the citizenry more broadly. Repression is *targeted* when it is directed only at members of an opposition group, like the opposition members who ‘disappeared’ in Argentina in the late 1970s (Robben, 2005). If the regime represses broadly, using force against both opposition members and non-members, the regime employs *mass* repression. For example, mass repression may take the form of compulsory closing of schools and businesses, as in the West Bank in the 1980s (Khawaja, 1993), or collectivization as under the Khmer Rouge (Kiernan, 2002). These types of repression largely map onto descriptions of discriminate and indiscriminate violence in the context of armed

conflict (Kalyvas, 2006; Zhukov, 2015). However, targeted and mass repression account for more forms of repression than lethal physical violence.

I show that preventive repression can deter participation in an opposition group through an opportunity cost mechanism. The key intuition that drives government repression is that citizens' security and material or economic concerns are linked. Repression activates both concerns but targeted and mass repression do so in distinct ways. The distinct effects of targeted and mass repression on citizens' willingness to join an opposition group can lead a regime to employ both types of repression concurrently. In this way, I diverge from current explanations for repression that emphasize a tradeoff between targeted and mass repression. Moreover, I identify a set of conditions under which governments gain by increasing targeted and mass repression together. The unique effects of targeted and mass repression give rise to their complementarity.

I model citizens who face a choice between economic participation and joining an opposition group, and a government that collects tax revenue, and therefore benefits from citizens' participation in the labor force. Each citizen's choice is determined by security concerns—citizens naturally seek to avoid repression—as well as their own affinity for the government and concerns for material well-being (Becker, 1968; Grossman, 1991). These three motivations, security, ideology, and material well-being, present citizens with a tradeoff. Joining the opposition provides an ideological benefit. However, opposition group membership, in part, determines an individual's potential exposure to repression because targeted repression is only directed at those who oppose the government.⁴ Alternatively, individuals that opt not to join the opposition receive some material benefit from participation in the economy.

⁴I abstract here from a specific form of repression. While states can employ a wide variety of repressive tactics, I consider differences in scope and scale of repression, not other dimensions like visibility or lethality. For a discussion of repression in autocratic regimes see Davenport (2007*b*).

The government has information about citizens' ideological preferences and can target individuals who join the opposition, using targeted repression. Targeted repression therefore makes joining the opposition riskier, activating citizens' security concerns. This creates a *participation incentive*, motivating some individuals to remain in the labor force. However, as more citizens prefer participating in the economy, the participation incentive generates a countervailing effect. A high proportion of citizens remaining in the labor force reduces the per capita material benefits for all individuals in the economy. This can in part negate the participation effect of targeted repression.

Mass repression, because it is directed at opposition members and non-members alike, does not activate security concerns in the same way as targeted repression. Yet, mass repression does affect the economy. The downside of mass repression, from the government's perspective, is that in addition to targeting potential opposition members, it also removes non-members from the labor force. However, because mass repression reduces the potential labor supply overall, the marginal benefits for those who remain in the labor market increases, negating, to some extent, the countervailing effect of targeted repression. This improves the material well-being of citizens who participate in the labor force. The *material well-being incentive* generated by the indirect effect of mass repression encourages economic participation, outweighing its negative direct effect on the potential labor pool, and yielding higher tax revenue for the government.

Thus, repression's effects are subtler than simply modifying citizens' risk of victimization. Repression has personal economic consequences for citizens. The participation and material well-being incentives capture how repression alters the opportunity cost of opposition participation by directly manipulating material incentives. In this way, targeted and mass repression can be complementary. Targeted and mass repression are complements when the cost of targeted repression is low and when, at high levels of mass repression, targeted

repression discourages more citizens from joining the opposition. That is, the marginal effect of increasing targeted repression on citizens' participation decision is larger when levels of mass repression are high. This provides an explanation for why, counterintuitively, governments repress broad swathes of their populations.

In line with observed incidents of repression, targeted and mass repression are not always complementary. I also specify conditions under which governments will substitute targeted repression for mass repression, or vice versa. In addition, I reproduce a common expectation that the regime is best off when it does not engage in mass repression (Lichbach, 1995; Mason and Krane, 1989; Wood, 2003). However, this only arises when I shut down my economic mechanisms, masking repression's effects on the economy.

Other scholars have focused on how states can manipulate individuals' ideological incentives by winning hearts and minds (Berman, Shapiro and Felter, 2011) or through propaganda campaigns (Little, 2017). In addition, there are other patterns of complementarity between repressive tactics than the one I explore in this article (Fariss and Schnakenberg, 2014), as well as other contexts in which governments trade off targeted and mass repression, like around elections (Bhasin and Gandhi, 2013). I focus not on an autocrat's uncertainty about the proportion of citizens who oppose the regime, but instead on how repression can shape opposition mobilization despite latent resentment of the government. By contrast, when an autocrat has imperfect (or incomplete) information about the size of a potential opposition, the regime may turn to mass killings to stay in power (Gregory, Schröder and Sonin, 2011) or reduce preventive repression as a gamble to activate regime supporters as well as opponents (Slantchev and Matush, 2020).

Indiscriminate repression has been shown to trigger increases in insurgent violence, make resistance movements less effective, and reduce collaboration between civilians and perpetrators (Condra and Shapiro, 2012; Finkel, 2015; Rueda, 2017). I consider the effects

of such repression prior to the onset of armed conflict. My framework isolates the effects of coercive force on individuals' security-economy tradeoff, and related decision to join the opposition. Opportunity cost provides a well-established explanation for opposition group participation (Blattman and Miguel, 2010). Citizens with limited economic opportunities face lower cost for leaving the economy to join the opposition (Chassang and Padro-i Miquel, 2009; Collier and Hoeffler, 2004). Examining labor demand more directly, Dal Bó and Dal Bó (2011) find positive shocks to labor-intensive industries reduce the risk of repression, while shocks that reduce commodity prices for labor-intensive industries have also been linked with an increase in repression (Dube and Vargas, 2013). Bueno De Mesquita (2005) endogenizes the opportunity cost of opposition participation to show a link between economic downturn and an increase in terror attacks. I similarly endogenize the opportunity cost of opposition participation and, by doing so, demonstrate that repression is not merely a response to opposition groups but also alters the composition of the opposition itself.

Most similar to my model, Esteban, Morelli and Rohner (2015) show mass killings may arise if the effects on future returns in labor-intensive sectors are lower than the value of economic surplus that a dominant group must share with an exploited group. While high levels of mass repression alone can also arise in my framework, I introduce selective violence to show how regimes mix targeted and mass repression to maximize their economic gains.

The Model

I develop a framework in which a government chooses whether and how to repress citizens and citizens choose whether to join the opposition or supply labor to the economy. Citizens' decisions are determined by a tradeoff between ideological and economic motives. The government seeks to deter mobilization of an opposition group and chooses a repression

strategy to manipulate citizens' incentives. In particular, the government's policy of repression affects citizens' security and material well-being. The government's chosen repression tactics shift the opportunity cost for individual citizens of joining the opposition through their effect on the economy. The regime chooses levels of targeted and mass repression that maximize its tax revenue. In this framework, I constrain the state such that its only available means of influencing citizens is repression.⁵

The game proceeds as follows: (1) The government chooses levels of targeted repression and mass repression to employ against the population; (2) Citizens decide to participate in the labor market or join the opposition and markets clear; (3) Payoffs are received.

Citizens

There is a unit mass of citizens normalized to 1 prior to any government repression. Every individual is endowed with an ideology θ_i distributed uniformly from $[\underline{\theta}, \bar{\theta}]$. Ideology is commonly known and captures an individual's view of the regime. Citizens' ideology may be driven by social and cultural factors like ethnic identity salience or anti-state attitudes. Higher values of θ indicate a greater distaste for the government, or degree of sympathy for the opposition.⁶ Individuals who opt to participate in the opposition receive an ideological benefit of participation equivalent to their ideology, θ_i .

Citizens who do not join the opposition participate in their local economy, where individuals supply labor, earn a wage, and consume goods. Wages are identical for each citizen in the labor force, and individual utility from economic participation is represented by

⁵Allowing the government to make investments that improve citizens' material well-being resembles a 'hearts and minds' style of counterinsurgency, which focuses on provision of public goods or services (Berman, Shapiro and Felter, 2011).

⁶Ideology is a commonly known type for each individual. Conceiving of θ_i as a privately known type requires Bayesian perfection as a solution concept but does not alter the results.

$u(c)$, where utility is a strictly increasing, strictly concave function of consumption. Citizens trade off economic and ideological incentives when choosing whether to support the regime or the opposition. I denote the choice to join the opposition as $e = 0$, while $e = 1$ represents a decision to work. This decision generates a cutoff in θ that represents mobilization for the opposition. The proportion of citizens who participate in the labor force is represented by λ , where $\lambda = \int_0^1 e_i di$.

Government

The government collects a tax, x , which is an excise tax on production. Tax revenue can be thought of as benefits the regime can spend or distribute to remain in power, or as spoils of office.⁷ The government values economic output because a strong economy not only generates greater tax revenues, but also implies the government is more likely to remain in power and reap the benefits of office (Londregan and Poole, 1990; Marinov, 2005; O’Kane, 1993). To capture this preference, I represent the government’s utility as tax revenue, $x \cdot Y(L)$.

The regime chooses levels of each form of repression to employ against the population in an effort to deter participation in an opposition group. Repression removes affected individuals from the political and economic spheres with certainty, meaning these individuals cannot join the opposition group or the labor force. The outcome of repression could take the form of imprisonment, exile, revocation of citizenship or work status, or physical repression. For the purpose of this analysis, the scope of the regime’s repression is of primary interest, rather than the severity or lethality of individual repressive acts. Each of these forms of repression could be employed by the government in carrying out targeted repression or mass

⁷Bueno De Mesquita, Smith, Morrow and Siverson (2005) offer a theoretical explanation of how regimes can be expected to distribute these benefits.

repression. The key distinction between targeted and mass repression is in which individuals are affected, not the type of violence used to carry out repression.

Targeted Repression

Citizens' ideologies are commonly known. Thus, the regime knows which citizens are its staunchest opponents and will join the opposition for certain. The regime directs targeted repression, $t \in [0, 1]$, against these individuals. Targeted repression is perfectly discriminating, affecting only identifiable opponents with no effect on individuals participating in the economy. To illustrate, in 2013, the Bahraini government began revoking the citizenship of those accused of terrorism, like activists, journalists, and religious scholars (Babar, 2017). By 2017, the regime had revoked the citizenship of around 450 individuals, specifically targeting “dissidents the authorities no longer regarded as members of the political community” (Alsabeehg, 2018, 135).

For all citizens, targeted repression triggers a *security concern* because targeted repression directly increases the risk associated with participation in the opposition. Because only opposition members face the risk of targeted repression, the security concern makes citizens less willing to join. For the government, targeted repression carries a linear cost, $k \cdot t$, which can be thought of as the price of gathering intelligence or learning citizens' ideology to identify opposition members.⁸ The opposition group's strength after the regime has carried out targeted repression is $(1 - t)$.

⁸Assuming this cost is a convex function of the level of repression does not qualitatively alter the results. In this case, diminishing returns from targeted repression would be compounded by increasing costs for the regime.

Mass Repression

Mass repression affects both opposition members and non-members equally. For example, the Ethiopian regime under Mengistu Haile Mariam destroyed crops and marketplaces and restricted labor and trade, both in an effort to prevent the spread of insurgency and to facilitate socialist transformation. This exacerbated the famine of 1983-1985 and according to some estimates, nearly half of the famine's mortality can be attributed to the regime's repressive policies (De Waal, 1991, 5). Because opposition members are no more likely to be affected by mass repression than non-members, mass repression does not trigger citizens' security concern. Instead, mass repression activates a *material well-being concern*. Mass repression alters the possible composition of the labor force and therefore changes the economic opportunities available to citizens. The level of mass repression is represented by $m \in [0, 1]$ and the total citizen population after government repression is $(1 - m)$.

Markets

The economy captures production and consumption in a distinct geographic area with a fixed capital endowment and represents a local economy in the short run. It consists of a labor market, production technology, and a goods market. Markets endogenously determines wages, the supply of goods, and prices for those goods for a given production technology, a potential labor pool, citizens' labor force participation decisions, and the government's repression choices. The labor supply, $L = (1 - m)\lambda$, depends on the size of the potential labor pool and the labor force participation rate.

A representative, profit-maximizing, firm hires citizens to produce a single good, y , using a labor input $L^\dagger \leq 1$, where L^\dagger is the number of citizens employed by the firm. The production technology is represented by $Y(L)$, where $Y(\cdot)$ is any strictly increasing, strictly

concave production function.⁹ The firms are independent of the citizenry and the government and consume all profits from production.¹⁰ Firms are price takers and production sets are closed, non-empty, and satisfy free disposal such that a representative producer represents aggregate production (Mas-Colell, Whinston and Green, 1995, 147-149).

Individuals who opt to work earn a wage, $w(L)$, where $w(\cdot)$ is the marginal revenue product of labor and is strictly decreasing in L . Individuals who participate in the economy have a consumption budget $w(L) \geq (p + x) \cdot c$ such that the amount consumed for a given price p and tax x cannot exceed the real wage. I call $p^* = (p + x)$ the equilibrium price accounting for the government's excise tax. Citizens consume goods such that supply and demand for goods are equal.

Utilities

The solution concept is subgame perfect Nash equilibrium. An equilibrium to the model is defined by the sextuple $(w^*(t, m), p^*(t, m), c^*(t, m), \theta^*(t, m), t^*, m^*)$, which gives an optimal wage, price, and individual consumption given the regime's repression strategy, the citizens' threshold strategy conditional on the repression choice, and optimal levels of targeted and mass repression. This equilibrium has three components. First, market clearing conditions, defined as follows, must hold.

Lemma 1 *Market clearing is characterized by:*

1. *Profit maximizing wages: $w^* = (p + x) \cdot Y'((1 - m)\lambda^*)$,*

⁹I include an analysis with a Cobb-Douglas production function in Appendix C.

¹⁰Firms are identical strategic actors that maximize profits given all other players' strategic decisions, but otherwise have no effect on the government's repression decision and citizens' participation choice. Extending the model to a private ownership economy is straightforward but requires a modification of the citizens' decision problem.

2. *Labor supply equals labor demand:* $(1 - m)\lambda^* = L^\dagger$,

3. *Goods supplied equal goods demanded:* $p^*Y(L^\dagger) = c^*$.

Proof for this lemma, and all formal results, are in the appendix. Second, a cutoff strategy in θ determines the portion of citizens participating in the economy. Given the government's chosen levels of repression, a citizen's expected utility is

$$U(e_i, \theta_i) = e_i \left((1 - m)u(c(t, m)) \right) + (1 - e_i) \left((1 - m)(1 - t)\theta_i \right).$$

The marginal citizen who is indifferent between participating in the economy and joining the opposition has ideology θ^* , which solves

$$\underbrace{(1 - m)u(c(t, m))}_{\text{material incentives}} = \underbrace{(1 - m)(1 - t)\theta^*}_{\text{ideological incentives}}. \quad (1)$$

Third, the government chooses levels of targeted and mass repression that solve

$$\max_{t, m} x \cdot Y((1 - m)\lambda(t, m)) - k \cdot t, \quad (2)$$

where $Y(\cdot)$ is the production function and the government maximizes its tax revenue.

Features of the Model

Before continuing, I offer a few comments on the model's assumptions. First, this model's aim is to offer an explanation of an observed phenomenon—the incidence of preventive mass repression and its frequent use in conjunction with targeted repression—not offer a prescriptive theory for countering opposition groups.

The economic channels identified in the model sometimes explicitly, though more often implicitly, influence citizens' responses to repression, and governments' motivations. As discussed previously, Operation Murambatsvina had a specific economic motivation—cracking down on illegal settlements and businesses. Citizens' personal economic concerns were not openly linked to changes in opposition participation following a government crackdown in Poland in 1968. However, university faculty who supported the student protest movement were dismissed, hundreds of involved students were selected for compulsory military service, and extensive purges of the state bureaucracy removed individuals who were allegedly Zionists, of Jewish origin, or both (Kemp-Welch, 2008). Repression, in this case, affected opposition members' security and many citizens' economic opportunities, leaving open government jobs to be filled by loyalists. This created opportunity for citizens to act on both their security and material well-being concerns in identifying either with the movement or the regime.

Short-run Economy: Regimes may benefit from a number of different revenue streams, whether licit or illicit, including tax revenue. For clarity of presentation, I focus only on tax revenue. The excise tax collected by the government can represent taxes collected from business legally through systematic, nationalized tax collection or taxes collected through extralegal means like protection rackets or bribery schemes. My framework shows how economic concerns can affect government repression and citizens willingness to join the opposition. Given this focus, the economy is simplified such that just one good is produced by a representative firm, where each citizens' labor has identical effects on productive output, and all receive equal wages. This parsimonious partial equilibrium framework with aggregate production has a number of substantively useful features, including that wages decrease when more citizens participate in the labor market, while abstracting from additional economic factors that less directly affect the government's tactical decisions. In Appendix *B*, I consider how an increase in total factor productivity affects repression, leading intuitively to a reduction

in targeted repression. Mass repression may decrease or increase, depending on the strength of the material well-being incentive.

I specifically consider the economic implications of repression in the short run. This implies the government does not risk its repression triggering capital flight (Davies, 2011), but also cannot benefit from foreign investments that would decrease the risk of opposition mobilization (Besley and Persson, 2011). Repression is not without risk for the regime. To carry out repression, an autocrat must ensure the compliance of the security apparatus (Tyson, 2018), and repression risks triggering revolution (Acemoglu and Robinson, 2000). Given these immediate risks of repression for regime survival, I study only its effects on economic activity in the short run. Also in Appendix *B*, I show that even if mass repression directly reduces productivity, the regime may employ increasingly high levels of mass repression. This is because the labor force participation rate is higher under the threat of mass repression than would be realized in the absence of repression.

Opposition Group: I aim to isolate the effect of government repression on the decision of citizens to participate in an opposition group. Therefore, I do not explicitly model the opposition group as an independent strategic actor. Formalizing the opposition group, either by adding some inducements for participation or costs imposed on the government, would not qualitatively change results and would in fact strengthen the governments incentives to repress.

Citizens in the model are equally productive.¹¹ If citizens in my model were differentiated by skill, the regime would have stronger incentives to target the most skilled opposition types. By modeling citizens as identically productive, I show the incentive to target potential

¹¹Repression and recruitment by opposition groups when citizens vary in their level of skills are explicitly addressing in Bueno De Mesquita (2005) and Lehmann and Tyson (forthcoming).

opposition members remains, even when their marginal impact on the success of the opposition may be small.

Backlash: Backlash against repression can entail both mobilization against the regime and increasing ideological polarization or antipathy towards the government. These are conceptually distinct effects of repression, and therefore it is important to disentangle their effects on government tactics. I isolate just one of these channels, considering repression's effect on opposition participation, holding fixed the distribution of ideology among citizens. Therefore, there is no change in citizens' underlying likelihood of joining the opposition caused by repression. Accounting for both effects of backlash by endogenizing ideology in the model, would make it no longer possible to isolate only repression's direct effect on opposition mobilization. The alternative grievance channel can also have important effects on repression, a concern explicitly addressed by Gibilisco (2021), who makes backlash endogenous to identify a tipping point above which a regime represses to preempt mobilization.

Citizen's Tradeoff

Security and material well-being incentives shape citizens' choices in the context of government repression, and the state manipulates these incentives to prevent opposition mobilization. I consider in turn the citizen's decision of whether to join the opposition or supply labor to the economy, and the government's repression. Citizens make their choice last, and thus, proceeding backwards, I consider their response to repression first.

The impact of repression on an individual is determined by their participation either in the opposition or labor force. Joining the opposition carries the risk of targeted repression. More importantly, because targeted repression is perfectly discriminating, it asymmetrically increases the risk of victimization—only individuals who choose to support the opposition

face the risk of targeted repression. The security concern driven by the risk of falling victim to targeted repression reduces the ideological benefit of joining the opposition, making economic participation more appealing. Citizens face the risk of mass repression whether or not they choose to participate in the opposition. Because mass repression targets both opposition members and non-members alike, the additional risk of victimization for an individual is equal regardless of the participation decision. In fact, the citizen's choice can be reduced such that the direct effect of mass repression drops out of the calculus, leaving only the material well-being concern.

The population's response to the regime's repressive efforts is represented by the marginal citizen who is indifferent between supporting the regime and joining the opposition. The threshold above which citizens join the opposition and below which they participate in the economy is represented by the marginal ideological type θ^* that solves Equation (1). This marginal individual characterizes the equilibrium labor force participation rate, which endogenously generates the wage offered to individuals participating in the economy.

Rearranging (1), the marginal type is $\theta^* = \frac{u(c(t,m))}{(1-t)}$. The unique labor force participation rate, then, is given by the proportion of citizens whose ideological preference for the opposition is equivalent to or less than this threshold. Given that ideological types are distributed uniformly over $[\underline{\theta}, \bar{\theta}]$, the labor force participation rate solves

$$\lambda^* = \frac{\frac{u(Y'((1-m)\lambda^*))}{(1-t)} - \underline{\theta}}{\bar{\theta} - \underline{\theta}}. \quad (3)$$

The citizens' optimal choice can be characterized by the more interpretable labor force participation rate.

Lemma 2 *For fixed levels of repression, t and m , the marginal citizen θ^* is characterized by a unique $\lambda^*(t, m)$, the equilibrium labor force participation rate.*

The regime will repress only if doing so can increase labor force participation, which increases its tax revenue. I restrict attention to this case for the remainder of the analysis.

Economic Motives for Repression

Proceeding to the government's repression strategy, the regime chooses levels of targeted and mass repression to maximize tax revenue. The regime's repression decision solves an optimization problem that accounts for the expected response of the citizenry, through the labor force participation rate, λ^* . The regime chooses repression to maximize,

$$\max_{t,m} x \cdot Y((1-m)\lambda^*(t,m)) - k \cdot t. \quad (4)$$

Before analyzing the equilibrium levels of targeted and mass repression, it is helpful to note that to receive positive utility, the government must ensure some citizens participate in the labor market. Thus, a predatory policy of repression without concern for cost is not optimal within this framework. The regime has no incentive to repress its entire population.

Lemma 3 *The government will never choose $m = 1$. For sufficiently high k , the government will never choose $t = 1$.*

Moreover, the government's problem does not immediately suggest the regime will prefer to use positive levels of either targeted or mass repression. Both types of repression are costly. Targeted repression carries an explicit cost k . Mass repression generates indirect costs by reducing the size of the potential labor pool, creating a ceiling for the regime's utility. Positive levels of repression are only optimal for the regime if their effect on labor force

participation exceeds their costs. The optimal levels of targeted and mass repression solve

$$\begin{aligned}
 x \cdot Y'((1-m)\lambda^*)((1-m)\lambda_t^*) - k &= 0, \\
 x \cdot Y'((1-m)\lambda^*)((1-m)\lambda_m^* - \lambda^*) &= 0.
 \end{aligned} \tag{5}$$

The amounts of targeted and mass repression employed by the state depend on the equilibrium wage, the direct and indirect effects of employing each type of repression on the labor force participation rate, and the cost of targeted repression. Repression, (t^*, m^*) , is chosen such that, accounting for the cost the government incurs for targeted repression, the change in wages resulting from repression is balanced by the change in utility for citizens in the labor force, driven by the change in the real wage.

The government's utility is increasing in both targeted and mass repression, for sufficiently low k , thus the regime will prefer to choose levels of t and m above zero. The government's best response to the citizens' choice is an optimum with $t^*, m^* \in (0, 1)$, which are implicitly defined by the first order conditions. In equilibrium, the regime will employ positive levels of both targeted and mass repression.

Proposition 1 *There exists a subgame perfect Nash equilibrium characterized by (λ^*, t^*, m^*) where λ^* represents the unique labor force participation rate and the regime employs both targeted and mass repression such that t^* and m^* solve $(1-m)\lambda_m^* = \lambda^*$ and*

$$- \underbrace{\frac{u(Y'((1-m)\lambda^*))}{u'(Y'((1-m)\lambda^*))}}_{\text{responsiveness of citizen's utility to repression}} \cdot \underbrace{\frac{Y'((1-m)\lambda^*)}{Y''((1-m)\lambda^*)}}_{\text{responsiveness of wages to repression}} = \underbrace{(1-t)}_{\text{cost of reducing opposition}} \cdot k.$$

The regime's repression strategy is chosen to balance the elasticity of citizens' personal economic benefits against its costs for reducing the opposition group to size $(1 - t)$ through targeted repression.

A novel implication of this equilibrium is that choosing a positive level of mass repression is optimal for the regime. A significant literature suggests mass repression is the result of some deficiency of the state—a lack of capacity, intelligence, or ability to withstand casualties (Downes, 2008; Eck and Hultman, 2007; Valentino, Huth and Balch-Lindsay, 2004). However, a positive level of mass repression is optimal in my framework because I am able to capture its downstream effect on the equilibrium wage offered in the economy. To see the effect of explicitly modeling this economic channel, I reassess the government's optimal repression strategy assuming wages are fixed.

Remark 1 *For a fixed wage, the government may employ targeted repression, $t^* \geq 0$, but will not utilize mass repression, $m^* = 0$.*

As is true for other theories of repression, targeted repression is an optimal choice (given it is not too costly) regardless of how repression affects citizens' material incentives. Targeted repression has no direct effect on the economy, and therefore is employed by the regime even when wages are fixed. Mass repression, however, is not optimal given fixed wages. In this case, observing mass repression would suggest the regime had erred or adopted a strategy of last resort—as predicted by existing theoretical accounts. What my framework makes clear is that this conventional explanation of mass repression hides an assumption that repression does not have personal economic consequences for citizens. When the labor force participation rate changes with repression, mass repression is a part of the government's optimal strategy. In fact, a strategy that employs both targeted and mass repression is optimal because each tactic has a distinct effect on the citizens' choice of whether to join the opposition.

Participation and Material Well-being Incentives

To isolate the mechanisms by which each type of repression affects citizens' incentives, I first consider targeted and mass repression independently.¹² Formally, these mechanisms are given by the effect of t and m on the labor force participation rate, λ .¹³ I refer to the labor force participation rate in this section as λ^\dagger to distinguish it from the labor force participation in equilibrium.

Targeted repression encourages labor force participation. Because targeted repression only impacts individuals who join the opposition, increasing t subsequently increases the risk associated with opposition membership. In this way, targeted repression triggers an individual's security concern. Participation in the economy does not carry the risk of targeted repression. Thus, for some individuals, the increased risk of targeted repression reduces their expected ideological benefits of opposition participation such that they will instead prefer continued participation in the economy. Targeted repression increases θ^\dagger such that fewer citizens support the opposition and the *participation incentive* generated by targeted repression has a direct effect of increasing the size of the labor force.

Remark 2 *For a fixed level of mass repression, labor force participation is increasing in the level of targeted repression.*

However, targeted repression also has a countervailing effect. The resulting increase in the number of citizens that prefer to remain in the labor force exerts downward pressure on wages. For some citizens, the value of material benefits offered in an economy flooded with labor will not be enough to exceed their ideological benefit from opposition membership,

¹²Using a formal model to fully explicate a mechanism is in line with the “*experimental perspective*” of Paine and Tyson (2020).

¹³While not a proper comparative statics analysis on an exogenous parameter, in the limited context of the citizens' choice subgame, the levels of targeted and mass repression are exogenous.

regardless of the increased repression risk. This renders the effect of targeted repression moot for these individuals.

Because mass repression targets both opposition members and non-members, it has no direct effect on labor force participation—the expected payoff for any individual reduces to the same tradeoff made in the absence of mass repression. However, mass repression has an indirect effect on the citizen’s tradeoff, through its effect on economic opportunity.

Remark 3 *For a fixed level of targeted repression, labor force participation is increasing in the level of mass repression.*

Mass repression has a negative direct effect on the labor market—it reduces the overall population of potential laborers. However, this reduction in the labor supply increases material benefits for non-opposition members in response to the new level of employment. This triggers citizens’ material well-being concern. As mass repression makes labor scarcer, an individual’s utility from economic participation increases and those whose ideological benefit from opposition participation is relatively low will continue to supply labor.

The indirect effect of mass repression dominates the direct effect such that overall, labor force participation increases with mass repression. A key feature of the model is that mass repression achieves an increase in labor supply without directly incentivizing labor force participation. The *material well-being incentive* is sufficiently powerful to make additional citizens prefer remaining in the labor market to joining the opposition. Thus, despite a reduction in the overall labor pool, this indirect effect is large enough to yield higher tax revenue for the regime. The participation and material well-being incentives enable the government to use repression to deter opposition mobilization. By employing both targeted and mass repression, the regime increases tax revenues and reduces the size of the opposition.

Repression Reinforces Repression

Having established why targeted and mass repression are optimal for the government, I now show how an autocratic regime may combine these types of repression to maintain its hold on power. Mass repression is commonly viewed as less desirable than targeted repression (Arreguín-Toft, 2001; Kalyvas, 1999; Kocher, Pepinsky and Kalyvas, 2011).¹⁴ Thus, we should expect that when the cost of targeted repression is low, governments should substitute targeted for mass repression.

The relationship between targeted and mass repression depends on two factors: the cost of targeted repression and the combined effects of targeted repression and mass repression on the labor force participation rate. As the cost of targeted repression decreases—circumstances under which governments are naturally expected to employ more targeted repression—the regime’s optimal strategy may be to increase mass repression as well. Complementarity arises because targeted and mass repression, used together, prevent opposition mobilization in two related ways. First, targeted repression directly reduces the size of the opposition. Second, mass repression compensates for the economic distortions created by targeted repression. The participation and material well-being mechanisms that drive citizens’ behavior make both types of repression optimal for the government.

Proposition 2 *Given the government’s equilibrium strategy (t^*, m^*) , when targeted and mass repression have reinforcing effects on labor force participation, $(\lambda_{mt}^* | t^*, m^*) > 0$, then a decrease in the cost of targeted repression leads to an increase in mass repression, $\frac{dm^*}{dk} < 0$, and targeted and mass repression are complements.*

The Stroessner regime in Paraguay in the 1970s illustrates how an autocrat can employ targeted and mass repression concurrently and use this repression to maintain his hold on

¹⁴Others have found that lethal indiscriminate violence can reduce violence by regime opponents (Lyll, 2009)

power. In 1974, security forces discovered a plot to assassinate President Alfredo Stroessner (Lewis, 1980, 100-101). Police arrested or killed all of the plotters before they could execute their plan, but identification of this nascent opposition led the regime to initiate a large-scale preventive crackdown. This wave of repression was not primarily caused by the assassination threat, but instead by the regime's "refusal to allow the existence of any autonomous interest groups" that might challenge it (Alexander, 1976).

After the discovery of the assassination plot, many unrelated groups faced a wave of targeted and mass repression. More than 1,000 government officials and members of Stroessner's party suspected of harboring anti-regime sentiment were removed from their positions (Hanratty, Meditz and Weil, 1990, 48). Catholic priests and leaders of the Peasant League were arrested for fear they may foment opposition (Stephansky and Alexander, 1976). Urban young professionals and citizens in rural areas suffered mass repression at random as the regime terrorized the population in an effort to deter mobilization against Stroessner (Alexander, 1976).

This wave of repression was motivated and enabled by changing economic circumstances in Paraguay in the 1970s. In 1973, Paraguay and Brazil signed the Treaty of Itaipu that led to the construction of the Itaipu hydroelectric dam.¹⁵ The Itaipu Dam reduced the Stroessner regime's cost for targeted repression in two ways. First, it improved relations with Brazil and Argentina, evidenced by the regime's concurrent participation in an intelligence sharing operation, Operation Condor, that targeted communists and dissidents (Zoglin, 2001). Second, it represented a significant revenue generator for the regime, funding its security forces and enabling a more aggressive repressive effort (Folch, 2013).

¹⁵Negotiations around dam construction began with the Iguazu Act in 1966. The timing of treaty signing was determined in part by the scientific exploration and construction bidding process and therefore represents a plausible shock to the cost of targeted repression appropriate for this comparative static analysis.

The dam not only reduced costs, allowing the regime to increase targeted repression, but also created jobs for tens of thousands of Paraguayans (Miranda, 1990, 112). Characteristic of the complementarity between targeted and mass repression, the economic growth spurred by the Itaipu Dam muted political discontent as increases in incomes deterred Paraguayans from challenging Stroessner (Nickson, 1988). As Paraguay approached nearly full employment in the mid 1970s, small groups of dissidents organized in exile or protested working conditions at the dam—as the model predicts, wages in a competitive labor market will be insufficient to deter all opposition (Folch, 2013; Lewis, 1980, 166). However, given the favorable economic conditions, Stroessner was able to combine targeted and mass repression to prevent widespread mobilization against his regime.

A necessary condition for complementarity is that the marginal effect of targeted repression on labor force participation is increasing in the level of mass repression (or vice versa). In other words, the participation incentive is stronger when the level of mass repression is high. This can also be thought of as the interaction effect of targeted and mass repression on labor force participation. When this interaction effect is positive, targeted repression's participation effect is reinforced by mass repression. In this case, the regime is willing to accept the costs of each type of repression in exchange for increased benefits it derives from employing higher levels of both.

Substituting Targeted and Mass Repression

Targeted and mass repression may also be substitutes for the regime, depending again on the cost of targeted repression and repression's economic effects. Substitutability of targeted and mass repression implies the marginal benefit to the regime of increasing the amount of mass repression is decreasing in the level of targeted repression, or vice versa. Therefore, if

the costs of targeted repression are reduced, the optimal level of targeted repression increases, and the government will trade targeted repression for mass repression. If the cost of targeted repression is high, regardless of repression’s personal economic consequences for citizens, the regime will substitute mass repression for targeted repression.

Proposition 3 *Targeted and mass repression are substitutes for the regime when:*

1. *mass repression decelerates the effect of targeted repression on labor force participation, $(\lambda_{tm}^* | t^*, m^*) < 0$. The government substitutes targeted for mass repression.*
2. *the cost of targeted repression is sufficiently high such that $\lambda^* \lambda_{mt}^* < \lambda_t^* \lambda_m^*$. The government substitutes mass for targeted repression.*

The regime will substitute targeted for mass repression when the cost of targeted repression is low and the marginal increase in labor force participation spurred by targeted repression is decreasing in the level of mass repression. In this case, mass repression depresses the effect of targeted repression on labor force participation. Intuitively, under these circumstances, governments would pursue highly discriminating repression strategies.

More surprising are cases where regimes substitute mass repression for targeted repression. This is the type of substitution exemplified by Operation Murambatsvina. When the cost of targeted repression becomes prohibitively high, an autocrat will shift to mass repression. For the Mugabe regime, the cost of targeted repression increased after the release of a report by the African Union Commission on Human and People’s Rights on repression in Zimbabwe (Human Rights Watch, 2005*b*). This international scrutiny led to a decline in arrests of opposition activists (Institute of Justice and Reconciliation and Solidarity Peace Trust, 2006).

With less ability to target opposition politicians, and allegedly fearing potential protests against economic conditions, the regime initiated a campaign of mass repression. The stated targets of Operation Murambatsvina were ‘economic saboteurs,’ and the regime’s violence

was brutal and indiscriminate (Bratton and Masunungure, 2007). Security forces made no effort to distinguish regime supporters from opponents.

Notably, Operation Murambatsvina was justified explicitly on economic grounds. By 2005, the Zimbabwean government was nearly bankrupt, and the informal economy supported most urban residents. The Governor of the Reserve Bank of Zimbabwe issued a public statement that the regime should “destroy the shadow forces in the economy” one day before the first clearing operation (Tibaijuka, 2005). In addition to this stated motive, as in my model, observers contend the true objective of the Mugabe regime was to reassert control over sales taxes and hard currencies (Bratton and Masunungure, 2007).

Despite the scale and brutality of Operation Murambatsvina, it counterintuitively did not result in significant opposition mobilization. Despite a decrease in the targeted repression of organized political opposition in 2005, regime opponents were “too embroiled in [their] own internal disputes to mobilise a public demonstration” in response to Operation Murambatsvina (Institute of Justice and Reconciliation and Solidarity Peace Trust, 2006). This may have resulted in low underlying ideological motivations for opposition participation. Moreover, the regime initiated a program, Operation Garikai/Hlalani Kuhle, to provide formal employment opportunities in the wake of Operation Murambatsvina. Few affected individuals benefited from Operation Garikai/Hlalani Kuhle, but for these citizens in particular the material well-being incentive would provide reason to participate in the labor force, despite potential grievance against the Mugabe regime (Luebker, 2008). While Operation Murambatsvina largely failed to yield its intended economic consequences, my framework identifies one set of mechanisms that could provide an underlying logic for the Mugabe regime’s mass repression. Thus, though the government’s rhetoric about economic stability rather than political opposition may feel disingenuous, my model suggests we should consider taking the regime at its word.

For governments, targeted and mass repression are substitutes not simply because targeted repression is more expensive. The tradeoff is subtler. Both types of repression achieve similar objectives for the government, each reducing the opposition threat by encouraging participation in the labor force. While mass repression affects citizens' material well-being concerns rather than their security concerns, it is sufficient to prompt some citizens to elect to remain in the labor force. Thus, when targeted repression is too expensive, the regime is willing to employ mass repression instead. In this way, the regime achieves a comparable outcome—less opposition—through a distinct channel, with lower direct costs. It is not necessarily the case that governments substituting mass repression for targeted repression will not employ any targeted repression. But, when the cost of targeted repression is sufficiently high, even regimes capable of implementing targeted repression will trade some targeted repression for mass repression.

Conclusion

Regimes that respond to the potential threat of opposition groups with repression must make a strategic choice about which individuals or groups to target with repressive force. Governments that choose targeted repression direct their coercive force against only those individuals who would opt to participate in an opposition group. In addition to, or instead of, targeted repression, regimes may employ mass repression that targets members of the opposition and non-members indiscriminately. All repression tactics manipulate civilians' tradeoff between material well-being and an ideological inclination toward the opposition. My model shows that both targeted and mass repression affect citizens' willingness to participate in an opposition group but operate through distinct channels. Targeted repression, because it only effects members of the opposition, triggers a security concern that prompts citizens to reconsider opposition participation and remain in the labor force. Thus, targeted repression

generates a participation incentive. Mass repression creates sufficient economic incentives to accommodate this shift in participation and ensures the benefits of economic participation are sufficiently high to deter citizens from joining the opposition. Consequently, mass repression produces a material well-being incentive.

My framework shows that targeted and mass repression employed in concert comprise an optimal strategy for regimes countering potential opposition movements. Because repression manipulates the opportunity cost of supporting the opposition, through the participation and material well-being incentives, governments will preemptively employ both targeted and mass repression. In these ways, repression provides dual benefits for the regime of deterring opposition group mobilization and increasing its own tax revenue. These participation and material well-being mechanisms provide a rationale for the joint usage of targeted and mass repression. Moreover, for the government these two types of repression are, in some cases, complements. Regimes able to afford more targeted repression may also employ more mass repression. Departing from existing literature, my model shows that when the cost of targeted repression is low—when other scholars would expect no mass repression—the economic mechanisms I identify instead can generate complementarities between targeted and mass repression. Under different circumstances, governments will prefer to substitute targeted for mass repression, or vice versa. Mass repression is a less costly substitute for particularly low-capacity states, while targeted repression is desirable for more capable regimes when repression’s effects on citizens’ incentives are not reinforcing.

My framework identifies one set of mechanisms and underlying conditions that could give rise to preventive mass repression. In doing so, it points to ways to prepare for, deter, and respond to campaigns of repression that otherwise seem unpredictable, such as monitoring shocks to regimes costs for targeted repression. Further, my model’s predictions of the conditions under which targeted and mass repression complement, or substitute for, each other

indicate that an effect of repression on citizens' hesitancy to leave the labor market is underexplored. While this is admittedly difficult to measure, identifying a link between labor market entry and exit and state repression may further inform our understanding of how opportunity cost of opposition participation shapes civil conflict. Finally, the endogenous interaction between state repression and economic opportunity indicators, like wages, highlighted by my model indicate scholars should remain cautious when incorporating proxies for material well-being in regressions explaining repression. My framework supports the practice of empirically estimating the opportunity cost of conflict leveraging exogenous shocks to material well-being incentives, avoiding this endogeneity and providing clearer estimates of the effects of variation in opportunity cost of opposition membership. The effects of the participation and material well-being incentives may be explored further in future work, formal or empirical, by varying the distribution of sympathy for the opposition, and identifying whether repression effects this distribution directly, to reflect on the ground realities in different autocracies.

A Formal Results for Main Model

Proof of Lemma 1:

The local economy is represented by the strictly increasing, strictly concave production technology $Y(L)$, which takes a labor supply as input. The economy is assumed to have full employment, perfect competition, and fixed factor supplies $L = 1$ prior to or in the absence of government violence and opposition mobilization. Recall each citizen that chooses to participate in the economy earns a wage and consumes goods subject to the budget $w \geq c \cdot (p + x)$. Because utility is increasing in consumption, by Walras's law the budget will be satisfied with equality for each citizen. An individual citizen's expected utility from supplying labor is $(1 - m)u(c)$, which can be rewritten as $(1 - m)u\left(\frac{w}{p+x}\right)$ given the budget constraint. All citizens for whom $(1 - m)u\left(\frac{w}{p+x}\right) \geq (1 - m)(1 - t)\theta_i$ supply labor in the economy. The labor force participation rate is given by λ . Labor supply, then, is $L = (1 - m)\lambda$.

The economy consists of a unit mass of citizens, indexed by i , and J firms, indexed by j , with production sets Y_1, Y_2, \dots, Y_J . Each production set is non-empty, closed, and satisfies the free disposal property. Let $\pi_j(p)$ be the profit function and $Y_j(p)$ the supply correspondence for each firm j . Then the aggregate supply correspondence is,

$$\begin{aligned} y(p) &= \sum_{j=1}^J y_j(p) \\ &= \left\{ y \in \mathbb{R}^L \mid y = \sum_{j=1}^J y_j \text{ for some } y_j \in y_j(p), j = 1, \dots, J \right\}, \end{aligned}$$

which is the sum of the individual supply correspondences. Let each supply correspondence $y_j(p)$ be a differentiable function of prices. The aggregate production set is,

$$\begin{aligned} Y &= Y_1 + Y_2 + \dots + Y_J \\ &= \{y \in \mathbb{R}^L \mid y = \sum_{j=1}^J y_j \text{ for some } y_j \in Y_j, \text{ for } j = 1, \dots, J\}. \end{aligned}$$

Let $\pi^*(p)$ be the profit function associated with the aggregate production set and $y^*(p)$ be the supply correspondence associated with the aggregate production set. Then for all $p \gg 0$, $\pi^*(p) = \sum_{j=1}^J \pi_j(p)$, and $y^*(p) = \sum_{j=1}^J y_j(p)$. In other words, the solution to the aggregate profit maximization problem for prices p is the sum of the corresponding individual profit maximization problems. Therefore, for the remainder of the analysis I only consider the representative firm.

The representative firm is profit maximizing, where profits are given by $(p+x)Y(L) - w \cdot L$ where $(p+x)$ is the price of the good y produced by the firm, and $Y(\cdot)$ is the production technology. The firm then solves

$$\max_{L \in [0,1]} (p+x)Y(L) - w \cdot L,$$

with necessary and sufficient first order condition $(p+x)Y'(L) = w$. Posit an L^\dagger , which is the labor supply that solves the firm's problem. For a given wage w and optimally chosen labor supply L^\dagger , the firm's profit is

$$\pi(w) = (p+x) \cdot Y(L^\dagger(w)) - w \cdot L^\dagger(w).$$

For the labor market to clear, labor supplied by the citizens must equal labor demanded by the firm in equilibrium. Formally, labor market clearing requires $(1-m)\lambda^* = L^\dagger$. For this

to hold, there must exist a wage w^* such that labor supply equals labor demand, given that citizens are choosing optimally whether or not to supply labor and the firm is maximizing profits. Therefore, labor market clearing requires the threshold strategy that determines citizens' participation decision and the first order condition for the firm hold simultaneously. Using the firm's FOC and substituting for the wage in the citizen's strategy yields

$$(1 - m)u\left(\frac{(p + x)Y'(L)}{p + x}\right) \geq (1 - m)(1 - t)\theta_i. \quad (6)$$

Of interest is the unknown L in this expression. The L that solves this equation with equality is the equilibrium level of employment, which I will refer to as $L^* = (1 - m)\lambda^*$. From the first-order condition of the firm, L^* is the labor supply that ensures the value of the marginal product of labor equals the wage, i.e. $p^*Y'(L^*) = w^*$ (recall $p^* = (p + x)$ such that markets clear). Notice the right-hand side of Equation (6) is constant in w . Citizen's utility $u(\cdot)$ is continuous in wages w and $\lim_{w \rightarrow 0} u(w) = 0$, while as $\lim_{w \rightarrow \infty} u(w) = \infty$. Thus, by the Intermediate Value Theorem L^* exists and is unique.

Given equilibrium employment, it is straightforward to determine equilibrium wages and consumption. Returning to the firm's FOC, the wage in equilibrium is the marginal revenue product of labor $w^* = (p + x)Y'((1 - m)\lambda^*)$. Consumption is equivalent to the real wage, $c^* = \frac{(p+x)Y'((1-m)\lambda^*)}{p+x}$, which simplifies to $c^* = Y'((1 - m)\lambda^*)$. The last condition on consumption ensures household consumption equals the output from production. Optimal consumption, labor market clearing, and the satisfaction of the household budget constraint imply the goods market clears. ■

Proof of Lemma 2: First, assume a fixed t and m . This allows for focus on the relationship between θ and λ while bracketing out their mutual dependency on repression.

Consider the individual citizen's tradeoff $(1 - m)u(c) \leq (1 - m)(1 - t)\theta_i$. She will choose to join the opposition if the left-hand side is smaller than the right-hand side. This reduces to the comparison

$$u(Y'((1 - m)\lambda^*)) \leq (1 - t)\theta_i,$$

substituting for consumption as in Lemma 1. The marginal citizen that is indifferent between joining the opposition or participating in the economy is the citizen for which this equation is satisfied with equality.

Rearranging the payoff comparison for the marginal type

$$\theta^* = \frac{u(Y'(L))}{(1 - t)},$$

gives a threshold in the ideological space above which all individuals will join the opposition. Since ideology is distributed uniform from $[\underline{\theta}, \bar{\theta}]$, the labor force participation rate (i.e. the proportion of citizens who opt to participate in the economy) is derived from the CDF of the continuous uniform distribution.

$$\lambda^* = \begin{cases} 0 & \text{if } \theta^* < \underline{\theta} \\ \frac{u(Y'(L(t, m))) - \underline{\theta}}{\bar{\theta} - \underline{\theta}} & \text{if } \theta^* \in [\underline{\theta}, \bar{\theta}) \\ 1 & \text{if } \theta^* \geq \bar{\theta}. \end{cases}$$

Thus λ^* is uniquely determined by θ^* , and λ^* can be used to characterize the equilibrium labor force participation threshold strategy for the citizens. ■

Proof of Lemma 3: For mass repression, $m = 1$ cannot solve the first order condition in Equation (5) as the left-hand side would equal infinity. For targeted repression $t = 1$, the optimal labor force participation rate λ^* is undefined. Moreover, as t^* approaches 1, the

direct cost of targeted repression restrains the regime such that the benefits of repression can never compensate if k is sufficiently high, i.e. $k > Y((1 - m)\lambda^*)$. ■

Proof of Proposition 1:

Uniqueness of λ^* follows from Lemma 2. By construction, the choice of t and m that solve the government's optimization problem are sequentially rational. Thus, any solution to the government's problem, given λ^* , characterizes an equilibrium.

The regime's problem is

$$\max_{t \in [0,1], m \in [0,1]} x \cdot Y((1 - m)\lambda^*) - k(t).$$

Since the production function is continuous in t and m and $[0, 1]$ is compact, a solution exists by the Extreme Value Theorem. The solution is characterized by the first order conditions

$$x \cdot Y'((1 - m)\lambda^*)((1 - m)\lambda_t^*) - k = 0, \tag{7}$$

$$x \cdot Y'((1 - m)\lambda^*)((1 - m)\lambda_m^* - \lambda^*) = 0. \tag{8}$$

To characterize the equilibrium in a more substantively interesting way, first rearrange the first order condition in (8) for m ,

$$(1 - m) = \frac{\lambda^*}{\lambda_m^*}.$$

Then, this value can be substituted into the first order condition for t ,

$$x \cdot Y'((1-m)\lambda^*)((1-m)\lambda_t^*) = k$$

$$(1-m)\lambda_t^* = \frac{k}{x \cdot Y'((1-m)\lambda^*)}$$

$$\frac{\lambda^*\lambda_t^*}{\lambda_m^*} = \frac{k}{x \cdot Y'((1-m)\lambda^*)}.$$

Simplifying the left hand side and rearranging yields the expression in the text

$$\frac{Y'((1-m)\lambda^*)}{Y''((1-m)\lambda^*)} = -\frac{u'(Y'((1-m)\lambda^*))}{u(Y'((1-m)\lambda^*))} \cdot (1-t)k.$$

To show an interior solution (t^*, m^*) exists, notice Lemma 3 rules out the corner solutions $(1, 1)$, $(t^*, 1)$, and $(1, m^*)$ for sufficiently high k . Next, consider the case where the government employs neither type of repression, i.e. $(t^*, m^*) = (0, 0)$. Let $\lambda_0^* = \frac{u(Y'(\lambda_0^*)) - \theta}{\theta - \underline{\theta}}$ be the optimal labor force participation rate for $(t, m) = (0, 0)$. An interior solution requires that there exists some $\epsilon_t > 0, \epsilon_m > 0$ such that the government receives higher utility from choosing $(t^*, m^*) = (\epsilon_t, \epsilon_m)$ than $(t, m) = (0, 0)$.

Considering ϵ_m first, an interior solution implies $Y((1-\epsilon_m)\lambda^*) > Y(\lambda_0^*)$, holding $t = 0$ fixed temporarily. Since $Y(\cdot)$ is increasing in $L = (1-m)\lambda^*$, the relevant comparison is $(1-\epsilon_m)\lambda^* > \lambda_0^*$, which holds if the effect of a small increase in mass repression generates an increase in labor force participation greater than the proportion of the labor pool it eliminates. This comparison is $\frac{\partial Y}{\partial m} < \frac{\partial Y}{\partial \lambda^*} \left(\frac{\partial \lambda^*}{\partial m} \right)$, which is

$$Y'((1-m)\lambda^*)((1-m)\lambda_m^* - \lambda^*) < Y'((1-m)\lambda^*)(1-m)\lambda_m^*,$$

which holds when

$$(1 - m)\lambda_m^* - \lambda^* < (1 - m)\lambda_m^*.$$

At equilibrium, $\lambda^* = (1 - m)\lambda_m^*$. Substituting for λ^* on the left hand side, $(1 - m)\lambda_m^* - (1 - m)\lambda_m^* = 0 < (1 - m)\lambda_m^*$, establishing $(1 - \epsilon_m)\lambda^* > \lambda_0^*$. That the indirect effect of mass repression dominates can also be established by noticing that the first order condition implies the elasticity of labor force participation with respect to mass repression is positive. In addition, $\epsilon_t > 0$, is optimal when $Y((1 - \epsilon_m)\lambda^*) - k\epsilon_t > Y((1 - \epsilon_m)\lambda^*)$. This holds for sufficiently small k such that $\frac{\partial Y}{\partial t} > 0$. ■

Proof of Remark 1: The government's problem is to maximize tax revenue

$$\max_{t,m} x \cdot Y((1 - m)\lambda) - k(t),$$

where $Y(\cdot)$ represents the production function. The regime's chosen repression levels, t^\dagger and m^\dagger , represent a strategy for the modified government sub-game. Let the fixed wage be $\hat{Y} = Y((1 - m)\lambda^*)$ where λ^* does not depend on t or m . The government solves:

$$x \cdot \hat{Y} \cdot (1 - m)\lambda_t^* - k = 0,$$

$$x \cdot \hat{Y} \cdot \left((1 - m)\lambda_m^* - \lambda^* \right) = 0.$$

If wages are fixed, the citizens' security concern arising from targeted repression remains. Therefore, targeted repression still has a positive effect on the labor force participation rate, i.e. $\lambda_t^* > 0$. The government's choice $t^\dagger \geq 0$ solves the first order condition for targeted repression. However, since mass repression's effect operates through the wage, the marginal effect of mass repression on labor force participation when wages are fixed is zero, meaning $\lambda_m^* = 0$. However, the direct effect of mass repression on the labor force persists. Mass

repression removes some citizens from the labor supply, but not all citizens, i.e. $\lambda^* > 0$. Thus, mass repression, in this case, only has a direct effect of reducing the labor pool. Therefore, the government will always choose $m^\dagger = 0$. Mass repression arises exclusively through its effect on the labor market. ■

Proof of Remark 2:

Implicitly differentiating λ^\dagger ,

$$\frac{d\lambda^\dagger}{dt} = -\frac{\frac{1}{\bar{\theta}-\theta} \left(\frac{u(Y'(L))}{(1-t)^2} \right)}{\frac{1}{\bar{\theta}-\theta} \left(\frac{u'(Y'(L))Y''(L)(1-m)}{1-t} \right) - 1} > 0 \quad (9)$$

■

Proof of Remark 3:

Implicitly differentiating λ^\dagger ,

$$\frac{d\lambda^\dagger}{dm} = -\frac{\frac{1}{\bar{\theta}-\theta} \left(\frac{u'(Y'(L))Y''(L)(-\lambda^*)}{1-t} \right)}{\frac{1}{\bar{\theta}-\theta} \left(\frac{u'(Y'(L))Y''(L)(1-m)}{1-t} \right) - 1} > 0 \quad (10)$$

■

Proof of Proposition 2:

To determine gross complementarity and substitutability, consider $\frac{dm}{dk}$, the relationship between the cost of targeted repression and the level of mass repression. By the chain rule,

$$\frac{dm^*}{dk} = \frac{dm^*}{dt^*} \left(\frac{dt^*}{dk} \right).$$

t^* is characterized by the first order conditions for the government's problem. First, fix m to isolate the effect of an increase in k on equilibrium t^* , then by the implicit function

theorem,

$$\frac{dt^*}{dk} = -\frac{-1}{x \cdot Y''((1-m)\lambda^*)((1-m)\lambda_t^*)^2 + x \cdot Y'((1-m)\lambda^*)(1-m)\lambda_{tt}^*},$$

which is negative when $\lambda_{tt}^* < 0$.

Taking λ_t^* from Equation (7), and taking its derivative with respect to t , gives:

$$\frac{\partial^2 \lambda^*}{\partial t^2} = \frac{k \cdot Y''((1-m)\lambda^*)(1-m)^2 \lambda_t^*}{Y'((1-m)\lambda^*)(1-m)} < 0.$$

Since the first order conditions for the government also characterize m^* , call $\bar{m}(t)$ the level of mass repression that satisfies Equation (8), making explicit its dependence on t . Then if $\frac{\partial \bar{m}}{\partial t} \Big|_{t^*, m^*} > 0$, m^* and t^* are complements. Recall that for any interior solution to Equation (8), $\bar{m}(t) = 1 - \frac{\lambda^*}{\lambda_m^*}$. Differentiating with respect to t ,

$$\frac{\partial \bar{m}(t)}{\partial t} = -\frac{\lambda_m^* \lambda_t^* - \lambda^* \lambda_{mt}^*}{(\lambda_m^*)^2}.$$

Given that $\lambda^*, \lambda_m^*, \lambda_t^* > 0$, what remains is to sign the cross-partial of λ ,

$$\lambda_{mt}^* = -\frac{\frac{1}{\theta-\underline{\theta}} \frac{(1-t)(1-m)u'(Y'(L))Y''(L)(1-m)\lambda_t^* - \left(u(Y'(L))-\underline{\theta}\right) \cdot (-(1-m))}{\left((1-t)(1-m)\right)^2}}{\frac{1}{\theta-\underline{\theta}} \frac{(1-t)(1-m)u'(Y'(L))Y''(L)(1-m)}{\left((1-t)(1-m)\right)^2}} - 1.$$

This can be simplified to

$$\lambda_{mt}^* = -\frac{(1-t)(1-m)u'(Y'(L))Y''(L)\lambda_t^* + u(Y'(L)) - \underline{\theta}}{(1-t)(1-m)u'(Y'(L))Y''(L)} - 1.$$

Therefore, $\lambda_{mt}^* > 0$ when the following inequality is satisfied

$$-\frac{u(Y'((1-m)\lambda^*)) - \underline{\theta}}{(1-t)(1-m)u'(Y'((1-m)\lambda^*))Y''((1-m)\lambda^*)} > \lambda_t^*,$$

where λ_t^* follows from Equation (7),

$$\lambda_t^* = \frac{k}{x \cdot Y'(L)(1-m)}.$$

Having established the conditions under which λ_{mt}^* is positive, for equilibrium strategy profile (λ^*, t^*, m^*) , if $\lambda_m^* \lambda_t^* < \lambda^* \lambda_{mt}^*$ then m^* and t^* are complements. This holds when

$$-\left(\frac{u(Y'(L))}{1-t^*} - \underline{\theta}\right) \left(\frac{(1-t^*)(1-m^*)u'(Y'(L))Y''(L)\lambda_t^* + u(Y'(L)) - \underline{\theta}}{(1-t^*)u'(Y'(L))Y''(L)} - 1\right) > \frac{u(Y'(L)) - \underline{\theta}}{(1-t^*)(1-m^*)} \left(\frac{k}{x \cdot Y'(L)(1-m^*)}\right). \quad (11)$$

If $\lambda_{mt}^* < 0$, targeted and mass repression are always substitutes. ■

Proof of Proposition 3: The proof follows immediately from the proof of Proposition

2. The proposition holds when $\frac{dm}{dk} > 0$.

1. If $\lambda_{mt}^* < 0$ then $\frac{dm^*}{dt^*} < 0$ and $\frac{dm^*}{dk^*} > 0$.

2. If $\lambda_{mt}^* > 0$ and k is sufficiently high such that Equation (11) does not hold, then m^* increases

■

B Repression and Productivity

In the main model, the production function $Y(\cdot)$ only depends on the labor supply, which is determined in equilibrium by citizens' labor force participation choices and state repression. In this appendix, I consider how additional factors that increase productivity affect my results. I assess first the impact of an exogenous increase in total factor productivity, which captures an increase in production efficiency, on equilibrium strategies. Then, I evaluate how the government's choice of mass repression may change if total factory productivity, along with the labor supply, are directly effected by repression.

B.1 Exogenous Increase in Total Factor Productivity

Let $A > 1$ be the exogenously determined total factor productivity for the production technology $Y(A, L)$. In the main model, total factor productivity is effectively held fixed at $A = 1$. This increase may reflect gains in efficiency or technological growth—acquired either via investments by firms or foreign direct investment. The government pays no costs associated with this increase in productivity.

I assume the production function of the representative firm $Y(\cdot)$ is increasing in A and $\frac{\partial^2 Y}{\partial L \partial A} > 0$ such that labor and total factor productivity are complements. A Cobb-Douglas production function, for example, satisfies this definition. Firms maximize profits, which are now represented by

$$\pi(w) = (p + x) \cdot Y(A, L^\dagger(w)) - w \cdot L^\dagger(w),$$

where L^\dagger represents demand for labor. The firms offer wage $(p + x)Y'(A, L^\dagger) = w$, which is higher than wages in the main model. To see this, notice an increase in A increases the

left-hand side and, to maintain equality, the wage increase. This is also implied by $\frac{\partial^2 Y}{\partial L \partial A} > 0$, which ensures the marginal product of labor (the wage) is increasing in A .

An increase in the wage implies fewer citizens would be willing to join an opposition group. To see this, notice

$$\frac{\partial \theta^*}{\partial A} = \frac{u'(Y_L(A, L^*))Y_{LA}(A, L)}{1 - t} > 0,$$

where Y_L is the L derivative of Y . Therefore, let $\hat{\lambda}^*$ be the labor force participation rate when $A > 1$, then $\hat{\lambda}^* > \lambda^*$ from the main model.

How does an increase in total factor productivity affect the government's repression strategy? The government now chooses targeted repression, t , and mass repression, m , to maximize,

$$\max_{t \in [0,1], m \in [0,1]} x \cdot Y(A, (1 - m)\hat{\lambda}^*) - kt.$$

Then, the first order conditions for the government's problem are

$$\begin{aligned} x \cdot Y'(A, (1 - m)\hat{\lambda}^*)((1 - m)\hat{\lambda}_t^*) - k &= 0, \\ x \cdot Y'(A, (1 - m)\hat{\lambda}^*)((1 - m)\hat{\lambda}_m^* - \hat{\lambda}^*) &= 0. \end{aligned}$$

The government now chooses a lower level of targeted repression $\hat{t}^* < t^*$. From the first order conditions, \hat{t}^* solves

$$x \cdot Y'(A, (1 - m)\hat{\lambda}^*)((1 - m)\hat{\lambda}_t^*) = k. \tag{12}$$

Given $\hat{\lambda}^* > \lambda^*$, the left-hand side of (12) is larger than in the main model for any t . Therefore, since the cost of targeted repression is unchanged, \hat{t}^* decreases to maintain equality.

The effect of an increase in total factor productivity on mass repression is more ambiguous. Simplifying the first order condition for m , the optimal level of mass repression solves

$$(1 - m) = \frac{\hat{\lambda}^*}{\hat{\lambda}_m^*}.$$

An increase in A increases both $\hat{\lambda}^*$ and $\hat{\lambda}_m^*$. Therefore, if $\frac{\hat{\lambda}^*}{\hat{\lambda}_m^*} > \frac{\lambda^*}{\lambda_m^*}$, then $\hat{m}^* < m^*$. Otherwise, if $\frac{\hat{\lambda}^*}{\hat{\lambda}_m^*} < \frac{\lambda^*}{\lambda_m^*}$, then $\hat{m}^* > m^*$. An increase in total factor productivity unambiguously decreases the level of targeted repression because fewer citizens are willing to join the opposition group, and the government needs to spend fewer resources to deter mobilization. On the other hand, total factor productivity both increases citizens' willingness to remain in the labor force *and* makes the material well-being incentive generated by mass repression more acute. Therefore, it may be the case that the government is best off increasing the level of mass repression to take advantage of this effect, depending on the magnitudes of $\hat{\lambda}^*$ and $\hat{\lambda}_m^*$.

B.2 Repression Decreases Total Factor Productivity

Next, I consider the possibility that mass repression reduces productivity. Mass repression may trigger capital flight, make foreign direct investment more risky, or disincentivize firms from making investments that would increase productivity. Therefore, in this extension, I include a direct dependence of total factor productivity on the level of mass repression. Specifically, $A(m)$ is now a strictly decreasing function with $A(0) > 1$. For ease of explication, assume the production technology is multiplicatively separable. A Cobb-Douglas production function, for example, satisfies this assumption.

The government's problem is now

$$\max_{t \in [0,1], m \in [0,1]} x \cdot Y(A(m)(1 - m)\bar{\lambda}^*) - kt,$$

with first order conditions

$$x \cdot Y_L(A(m)(1-m)\bar{\lambda}^*)((1-m)\bar{\lambda}_t^*) - k = 0,$$

$$x \cdot Y_A(A(m)(1-m)\bar{\lambda}^*)A'(m) + x \cdot Y_L(A(m)(1-m)\bar{\lambda}^*)((1-m)\bar{\lambda}_m^* - \bar{\lambda}^*) = 0.$$

The government choice of targeted repression follows from above. From the first order condition for mass repression, the government's optimal m solves

$$x \cdot Y_L(A(m)(1-m)\bar{\lambda}^*)((1-m)\bar{\lambda}_m^* - \bar{\lambda}^*) = -x \cdot Y_A(A(m)(1-m)\bar{\lambda}^*)A'(m),$$

which simplifies to $(1-m) = \frac{\bar{\lambda}^* - A'(m)}{\bar{\lambda}_m^*}$. Given A decreasing in m ,

$$\frac{d\bar{\lambda}^*}{dm} = -\frac{\frac{1}{\bar{\theta}-\underline{\theta}} \left(\frac{u'(Y'(A(m),L)) [Y''(A(m),L)A'(m) + Y''(A(m),L)(-\lambda^*)]}{1-t} \right)}{\frac{1}{\bar{\theta}-\underline{\theta}} \left(\frac{u'(Y'(A(m),L))Y''(A(m),L)(1-m)}{1-t} \right) - 1} > 0.$$

Thus, $\bar{\lambda}^*$ is still increasing in m and the numerator of this expression is larger than for $\hat{\lambda}^*$.

Therefore $\bar{\lambda}_m^* > \hat{\lambda}_m^*$.

In addition, $\bar{\lambda}^* - A'(m) > \hat{\lambda}^*$. Again, the effect on mass repression is ambiguous. If $\frac{\bar{\lambda}^* - A'(m)}{\bar{\lambda}_m^*} > \frac{\hat{\lambda}^*}{\hat{\lambda}_m^*}$, then $\bar{m}^* < \hat{m}^*$. Otherwise, $\bar{m}^* > \hat{m}^*$. Even if mass repression makes production less efficient, the government may still employ mass repression. In particular, if the material well-being incentive is strong enough, the regime may choose to increase the level of mass repression despite the negative direct effect on total factor productivity.

C Functional Forms

To make the equilibrium and comparative static results more concrete, in this appendix, I choose explicit functional forms for the production function and the citizen's utility. This serves to illustrate the reasonableness of the strict concavity assumptions in the main model and demonstrate the model's consistency with common assumptions about production technologies. Since the distribution of ideology does not change relative to the main model, I make the normalization $[\underline{\theta}, \bar{\theta}] = [0, 1]$ for clarity and ease of reading.

For this appendix, I assume that the production function is Cobb-Douglas, taking the form $Y = L^{\frac{1}{2}} = ((1 - m)\lambda^*)^{\frac{1}{2}}$. The citizen's utility function is $u(c) = \frac{c^{1/2}}{2}$.¹⁶ The optimal labor force participation rate, then, is

$$\lambda^*(m, t) = \frac{\sqrt{2}((1 - m)\lambda^*)^{-1/4}}{1 - t}.$$

Before proceeding, it is worth noting that $\lambda^*(m, t)$ is a partial differential equation, the solution of which depends on the choice of functional forms. Changing the functional form for either production technology or the citizens' utility changes the solution to this PDE.

Having pinned down the citizen's choice under these assumptions, we proceed to the government's choice of targeted and mass repression. The regime's problem is

$$\max_{t \in [0, 1], m \in [0, 1]} ((1 - m)\lambda^*)^{\frac{1}{2}} - k(t).$$

¹⁶All results from the main model also hold with Cobb-Douglas utility.

This gives first order conditions

$$\begin{aligned}\frac{1}{2}((1-m)\lambda^*)^{-\frac{1}{2}}(1-m)\lambda_t^* - k &= 0, \\ \frac{1}{2}((1-m)\lambda^*)^{-\frac{1}{2}}((1-m)\lambda_m^* - \lambda^*) &= 0,\end{aligned}$$

where

$$\lambda_t^{\dagger} = -\frac{\frac{\sqrt{2}((1-m)\lambda^*)^{-1/4}}{(1-t)^2}}{\frac{\sqrt{2}((1-m)\lambda^*)^{1/4}(-\frac{1}{4}((1-m)\lambda^*)^{-3/2}(1-m))}{1-t} - 1} > 0,$$

and

$$\lambda_m^{\dagger} = -\frac{\frac{\sqrt{2}((1-m)\lambda^*)^{1/4}(-\frac{1}{4}((1-m)\lambda^*)^{-3/2}(-\lambda^*))}{1-t}}{\frac{\sqrt{2}((1-m)\lambda^*)^{1/4}(-\frac{1}{4}((1-m)\lambda^*)^{-3/2}(1-m))}{1-t} - 1} > 0.$$

Since the production function is continuous in t and m and $[0, 1]$ is compact, a solution exists by the Extreme Value Theorem.

Turning now to the results on complementarity and substitution, of interest again is the effect of a change in the cost of targeted repression on the level of mass repression, given by

$$\frac{dm^*}{dk} = \frac{dm^*}{dt^*} \left(\frac{dt^*}{dk} \right).$$

Differentiating t^* implicitly,

$$\frac{dt^*}{dk} = -\frac{-1}{-\frac{1}{4}((1-m)\lambda^*)^{-3/2}((1-m)\lambda_t^*)^2 + \frac{1}{2}((1-m)\lambda^*)^{-1/2}(1-m)\lambda_{tt}^*},$$

which is negative when $\lambda_{tt}^* < 0$. The proof of Proposition 1 shows this holds in equilibrium.

The cross-partial of the labor force participation rate, given the functional form assumptions, is positive when

$$2 \cdot x \cdot ((1-m)\lambda^*)^{\frac{1}{2}} > k(1-t)((1-m)\lambda^*)^{-\frac{3}{4}}.$$

Complementarity therefore holds when

$$4\sqrt{2}(1-m)\lambda_t^*((1-m)\lambda^*)^{\frac{5}{4}} + \frac{16((1-m)\lambda^*)^{\frac{5}{2}}}{(1-t)} > \frac{2k\sqrt{2}((1-m)\lambda^*)^{\frac{1}{4}}}{(1-m)^2(1-t)x}.$$

Both of these conditions hold for some x and k , and therefore the complementarity results hold with these functional forms.

D Convex Production Technology

In this appendix, I relax the assumption that wages are decreasing in labor supply and compare the government's choice of repression in each case. Let $\tilde{Y}(\cdot)$ be a weakly convex production function such that wages are either constant or increasing in the labor supply.

When wages are increasing in labor supply, $\tilde{\lambda}$ can only take one value, $\tilde{\lambda} = 1$. No individual will participate in the opposition because the economy will sustain a wage such that all citizens prefer the labor market to the opposition group. That is, for each individual that chooses to participate in the labor force, the wage rises, making even more individuals with higher types θ_i willing to work. This cascades until attaining full labor force participation.

When wages are increasing in labor supply, the regime will not find using either type of repression optimal in equilibrium. Since labor force participation is already full, i.e. $\tilde{\lambda}^* = 1$, repression can have no positive effect. Using targeted repression has a no effect and only generates a cost, as there are no opposition group members for the government to target. Therefore, the regime will avoid the cost from k and choose $\tilde{t}^* = 0$. The government will also choose $\tilde{m}^* = 0$ because using any $\tilde{m}^* > 0$ only has a direct effect of reducing the labor pool and no effect on labor force participation.

The case of constant wages is addressed in Remark 1.

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