# Explaining Persistent Duopolies of Violence: How the State Gets Drug Gangs to Govern for It*

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**Abstract**

Armed criminal governance over civilians is pervasive, resilient, and concentrated in urban zones within easy reach of the state. If states strive to establish Weberian monopolies, why do duopolies of violence persist? Perhaps the premise is wrong. "Market for protection" models offer limited traction: theoretically, they assume competing providers prefer monopoly; empirically, drug-retailing gangs often govern without charging taxes. Instead, I develop a public-goods model where state and criminal governance overlap and benefit both actors. I compare McGuire and Olson's (1996) model of (monopolistic) stationary banditry with a modified version that includes a second bandit—the gang—in terms of the state's utility, social welfare, and total governance. All three can be higher under criminal duopoly iff gangs' costs of governance-provision are lower. If lower costs flow (in part) from gangs' recourse to illegal violence, states cannot simply hire or copy them (unless states suspend civil rights, as occurred in El Salvador). Adding a retail drug market in which gang governance (and taxation) affect drug profits by winning (or losing) residents' loyalty, the state may prefer duopoly even under equal costs of governance. Policing of drug retailing incentivizes gangs to cut taxes and channel illicit profits into governance, making duopoly preferable even though more drugs are trafficked. This requires the "pain" of drug trafficking to the state be neither too high (so that it monopolizes), nor too low (so that it decriminalizes and gangs lose the incentive to govern). If the state moves first, however, it might fight a drug war it cares nothing about merely to get gangs to govern for it.

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# 1 Introduction

In the 20th century, disagreements about the proper role of the state in economic and political life drove epic confrontations, both military and ideological. By the 21st, the dust had settled: on the one hand, the Marxian idea that states should monopolize economic production has been mostly abandoned. On the other, Weber's definition of the state as "a human community that (successfully) claims the monopoly of the legitimate use of physical force within a given territory" (1946) stands unchallenged by rival conceptions. Real-world leaders and policymakers regularly invoke it, if not as a description of their states then as a shared aspiration. Political economists shored up this consensus by modeling monopolies of violence as natural and sometimes welfare-maximizing equilibria in "markets for protection" (e.g. Konrad and Skaperdas, 1997; Skaperdas and Syropoulos, 1997). Yet whereas the Fundamental Theorems of Welfare Economics compare market and command economies explicitly (and rather defensively), Weberian monopoly is rarely pitted against its alternatives. Whether from the perspective of state or society, the preferability of Weberian monopoly to shared governance among armed actors is more assumption than result.

This is surprising, since the primacy of the Weberian ideal is not reflected in empirical reality. Across both time and space, Weberian monopoly is the exception; overlapping sources of authority and governance, each backed by their own arsenals of coercive power, is the rule.[1] Why do some states successfully monopolize, while others do not? Why do zones of fragmented and overlapping control persist? Such questions are typically asked by scholars of civil wars and state-formation, yielding intriguing theories of "outsourcing" (Acemoglu et al., 2013) and "optimization" (Staniland, 2012) of legitimate force (as opposed to monopolization) by "standoffish states" (Slater and Kim, 2015) over sparse or distant populations (Herbst, 2014).

Yet these theories offer limited purchase on what is by now the modal non-Weberian scenario: gang rule over civilians in the sprawling urban peripheries of the developing world. Affecting tens if not hundreds of millions of citizens in Latin America alone (Uribe et al., 2025), criminal governance is both substantively important and uniquely puzzling. Unlike rural insurgencies, criminal groups govern populationally dense zones near to the core of state power, and integral to developmental models based on urbanization. Moreover, criminal governance appears to be positively correlated with state capacity and repression (Barnes, 2023; Blattman et al., 2024; Magaloni et al., 2015; Uribe et al., 2025). Indeed, states are not absent: citizens obey laws, use public services, vote, and generally pay some form of taxes

[1] It was only "since the seventeeth century," Charles Tilly (1990) reminds us, that "Weber's historically contestable definition of the state... finally began to make sense for European states."

along the way. What pertains is a "duopoly of violence" (Skaperdas and Syropoulos, 1997, 61), antagonistic at one level but symbiotic at another, and surprisingly persistent. In places like Brazil, El Salvador, and Medellín, gangs have governed peripheries for decades, in the face of militarized state repression that has generally intensified over time.

The rise and persistence of such duopolies of violence are the central puzzle of the book project from which this paper flows (Lessing, 2026). Typically, they are blamed on a lack of state capacity; this "null hypothesis" is slippery, often obscuring more than it reveals. For one thing, in my cases, states *have* built and deployed significant repressive capacity—with world-record levels of incarceration and lethal policing—yet almost never explicitly direct it toward monopolizing governing authority or curbing criminal governance per se. Perhaps then, what states lack are the "right" capacities. Of course, "right" leaves significant wiggle room for unfalsifiable claims. Yet even if we blame persistent duopolies on specific forms of state weakness—like myopia, prison overcrowding, corruption, or lack of local governing know-how—*and* we observe such weakness in our cases, we still have not explained persistence. That is because states, if truly Weberian monopolizers, should have strong incentives to build the "right" capacities over time.

I argue that the premise is mistaken: states find criminal governance useful, and so do not strive to eliminate it. This is not, at bottom, because of corruption, misunderstanding, or any other lack of capacity. States actively fight crime with resource-intensive measures, like mass incarcertation and militarized policing. Their very efficacy, however, can create resources and incentives for criminal groups to govern: repression of drug retail markets, for example, may not only increase traffickers' potential profits (Becker, 1974; Castillo and Kronick, 2020), but make winning resident loyalty through robust governance a good defensive tactic. By definition, that makes law enforcement more difficult, yet it simultaneously benefits the state, whose peripheries—critical to larger processes of urbanization, modernization, and economic development—are governed at little or no direct cost, often more effectively than the state would have done on its own. Critically, criminal governance not only permits but encourages residents' participation in the licit economy: e.g. secure property rights foster both local economic growth and allow residents to work in formal areas without fear of, say, home break-ins. These concrete, fiscal benefits erode states' incentives to reorient repressive capacity toward eliminating criminal governance, even if doing so would reap political windfalls.

This paper formalizes the argument. I model the interdependent choices of a state and a gang over governance and taxation, and compare the state's fiscal payoffs and other outcomes to those under Weberian monopoly. The model proper is embedded in a broader framework that specifies and draws out empirical implications of my argument versus the conventional, state-weakness explanation of persistent duopoly. This "null hypothesis" is

formalized as prohibitively high (or infinite) "transition costs" to monopoly, without which the state would be better off monopolizing. Empirically, transition costs appear low, undermining this hypothesis. In contrast, I argue that duopoly can yield net fiscal benefits (under conditions the model shows are plausible), enough to outweigh the (unmodeled) political costs of tolerating duopoly, such that the state would not monopolize even if transition costs are negligible.

Such a state would not be "stuck with" duopolies of violence any more than capitalist states are "stuck with" market economies. Rather, in both cases, the state nurtures, incentivizes, and ultimately depends on private organizations to help it solve fundamental problems, tapping into "efficiencies" that leave it in some sense better off (despite the risks that these empowered private organizations pose (e.g. Smith, 1925).). If such states lack the capacity to monopolize (politically or economically as the case may be) it is because they are not trying to.

From this angle, when states "come to terms with... the duopoly of violence that exists in the gang's territory" (Skaperdas and Syropoulos, 1997, 61) they are not trying and failing at Weberian monopolization; rather, they are succeeding at an alternative, in some sense preferable, shared project of governance. Even if state leaders do not deliberately establish such projects, many effectively sustain them, choosing not to target criminal governance per se while doubling down on conventional forms of repression that keeps gangs governing. Indeed, just as capital accumulation did not (as Marx predicted) undermine capitalism, state-building alone is less likely to produce Weberian monopolization than entrench duopolies of violence. This is troubling, because duopoly is normatively problematic and likely inferior to Weberian monopoly from a social welfare perspective. All the more reason to understand how and when its fiscal benefits might weaken states' incentives to monopolize.

This requires a modeling approach in which duopoly can be but is not always "preferable" to monopoly. This rules out models of market duopolies, which assume states and gangs are strict competitors and thus always prefer monopoly. I turn instead to political-economy models that focus on the incentives that push stationary bandits to provide public goods in the first place. I compare McGuire and Olson's (1996) model of (Weberian) stationary banditry to a novel version including a second bandit—the gang. Each bandit sets a tax rate and provides public goods (governance) that are non-rival and non-excludable. This corresponds to settings like El Salvador without lucrative retail drug markets, where governing gangs primarily live off extortion. To capture settings like Brazil, I then add a drug market in which gang governance and taxation affect its ability to protect drug profits from loss to police enforcement. I compare this to a Weberian monopoly in which the gang still trafficks drugs but is unable to govern or tax.

Without a drug market and assuming (nearly) equal costs of governance provision, total taxes are higher, total governance lower, and economic production lower under duopoly. These deadweight losses make monopoly preferable—formalizing the core Weberian intuition. However, if the gang's cost of governance is significantly lower, the state may prefer duopoly—even if less total governance is provided—since it gets the gang to do most or all of the governing. This raises the question why the state does not hire the gang or copy its technology. One reason is that gangs' cost advantage stems, in part, from their very illegality, especially their recourse to violence punishments without due process.

I identify conditions for "low-governance traps" in which the state prefers the regime where less total governance is provided, and "malign outcomes" in which the state prefers the regime with lower social welfare (in McGuire and Olson's (1996) narrow, fiscal sense of post-tax economic production). Worse-case scenarios are possible, in which the state prefers duopoly even though it produces less governance and social welfare. In others, duopoly can be preferable and produce more governance and even social welfare, albeit at the (unmodeled) political and social costs to the state and residents of tolerating duopolies.

This iteration of the model illuminates the case of El Salvador, where drug retailing is insignificant and *mara* gangs governed peripheries based on extortion (e.g. Brown et al., 2022). The *maras* seem to have provided very little governance, and lowered economic output (Melnikov et al., 2022). Nonetheless, state leaders, including President Nayib Bukele, alternately combated and struck secret truces with gangs, without systematically eliminating their rule (e.g Cruz and Durán-Martínez, 2016; Meléndez-Sánchez and Vergara, 2024). The model suggests this was a malign low-governance trap, with the state willing to accept paltry gang governance and negative economic impacts because it saved on the costs of providing it itself. Only after Bukele consolidated authoritarian control in 2022—plausibly giving him the same cost advantages as the gangs—did he establish Weberian monopoly.

I then add a retail drug market to the model. I assume that drug profits hurt the state (via the anti-social effects of drug consumption) and so it invests in policing to curb them. The gang can reduce its losses to policing by winning resident loyalty through both increased governance and lower taxation. If potential drug profits are large enough, the gang does not tax at all (as is common in Brazil), and the state sets the same revenue-maximizing rate as under Weberian monopoly. Here, even assuming equal costs, total governance is higher under duopoly than monopoly, and under plausible parameter conditions the state prefers duopoly. This is possible because the gang channels profits from the drug trade into governance, providing more than could be supported by stationary banditry alone. Through this roundabout—but in no way corrupt—mechanism, drug profits fiscally benefit the state, even while it suffers direct disutility from them.

The scope of drug profits and their costs to the state turn out to be critical, "goldilocks" parameters. If too high, the state prefers to monopolize primarily as a means of reducing drug trafficking; if too low, the state does not police the drug trade enough to incentivize gang governance. Yet the lower bound disappears if the state can commit to policing: it will aggressively fight a drug war it cares nothing about, solely to induce the gang to provide governance. Such commitment power—which might come from campaign promises, annual policing budgets, and general demonization of traffickers—produces higher governance and greater fiscal benefits under duopoly, expanding the range where it is preferable to monopoly. Such equilibria illuminate cases like Rio de Janeiro, where for decades intense and lethal police raids on retail corners in favelas overlap with robust criminal governance that has all but eliminated property crime and everyday disorder there.

The following sections present background and some stylized facts. I then introduce the modeling framework, the "workhorse" model of dual stationary bandits without drug retailing, followed by the extended model with a drug market.

# 2 Background: Criminal Governance and Duopolies of Violence

This article follows Lessing's (2021) definition of criminal governance:

> [T]he imposition of rules or restrictions on behavior by a criminal organization. This includes governance over members, non-member criminal actors, and non-criminal civilians.

Criminal groups' internal governance institutions are fascinating in their own right, but also can be extended over non-member criminal actors and markets, as well as civilians (e.g. Leeson, 2007; Leeson and Skarbek, 2010; Lessing and Denyer Willis, 2019). Governance of non-member criminal actors and markets, in turn, is hugely important: pacifying and intensifying illicit activity and concentrate profits (e.g. Campana and Varese, 2018; Gambetta, 1993). A key example is prison gangs' unique ability to pacify and consolidate local monopoly power in drug retailing markets across large swathes of territory (e.g. Skarbek, 2011; McCann, 2013; Lessing, 2008). This paper focuses on governance over non-criminal civilians. Lessing (2021) labels this "gang rule", and notes that it may be the most puzzling form of criminal governance, as its costs are obvious while its benefits are not, and because so many criminal organizations *do not* govern civilians.

Criminal groups often posses ample governance resources. First and foremost, guns and members trained and willing to use them; though acquired as an input into their illicit activities (whether for defense, offense or both), such coercive force can serve double duty, to

establish governing authority over civilians. This unconstrained recourse to violence likely gives gangs a cost advantage over the state in providing order. Additional advantages may flow from gangs' internal governance institutions, which can be repurposed to resolve civilian disputes and impose codes of behavior, as well as local knowledge and information-gathering resources where they are tightly embedded in communities.

Still, criminal organizations only govern civilians if they have incentives to. While governing might have intrinsic value—the "warm glow" of a benevolent dictator, or the thrill of power itself—from a modeling perspective it is more interesting to focus on the material or strategic benefits of gang rule. Here, I focus on two such motives, discussed in Lessing (2021): increase revenues from taxation, and protecting drug profits from losses due to policing.

The concept of a gang–state "duopoly of violence" was introduced, to the best of my knowledge, by Skaperdas and Syropoulos (1997, 61) in a seemingly off-hand comment:

> The relationship between state authorities and gangs or other elements of organised crime is seldom completely antagonistic. Often the relationship is symbiotic, a 'live-and-let-live' arrangement. For the police, the justice system, the politicians all have to come to terms with the fact that the state does not have complete control and frequently in the duopoly of violence that exists in the gang's territory the gang has the largest market share. Hence, despite the occasional mobilisations of the state and the official proclamations, tacit arrangements of division of turf and self-restraint on the part of both gangs and state authorities represents the more normal state of affairs. Of course, there are also cases of bribery and material participation of state authorities in gang activities, but there is no need to invoke these to say that the relationship is symbiotic (Skaperdas and Syropoulos, 1997, 61)

The passage is pregnant with insight, in particular the critical point that police corruption is orthogonal to the issue of criminal governance. Yet whereas the authors go on to model a very different scenario, of two "primitive states" competing for eventual hegemony, I model the duopoly of violence as described, with an established, overarching state interacting with a criminal organization. I push back on the idea that states "have to come to terms with" criminal governance, by showing that even when states can costlessly eliminate it, they may prefer not to. I also deliberately reject the idea of "market share" by eschewing a market duopoly framework in which state and gang compete for customers,[2] instead assuming that governance is a public good and taxation is coercive and distortionary.

[2]My co-authors and I explore such market-duopoly modeling approaches in Blattman et al. (2024).

# 3 Stylized Facts

This section presents a few descriptive regularities about criminal governance over civilians, henceforth "gang rule", and its relationship to state governance. Gang rule varies widely in intensity, style, and the practices and institutions that sustain it; counterexamples to all of the following can surely be found. This list is also not a complete characterization of gang rule, highlights some of its more puzzling traits, traits which inform or are illuminated by the formal model below.

## 3.1 Gang rule is pervasive

Because it is illegal, gang rule is not always easy to measure. It is documented most convincingly in studies (often ethnographic but occasionally quantitative) of individual settings. These show that intense gang rule—often integrated into political systems—exists in diverse contexts throughout the Americas (e.g. Arias, 2017; Blume, 2021; Ley et al., 2019), but they tell us more about the intensive than extensive margin. To remedy this, my co-authors and I (Uribe et al., 2025) draw on imperfect but nationally representative data from the 2020 Latinobarometro survey of 18 countries. Across the region, 46% of respondents reported the presence of a criminal or armed group, and 14% indicated that the group provided order or reduced local crime, with no country reporting less than 5%. If truly representative, this indicates corresponds to 77-101 million people living with criminal governance in Latin America.

## 3.2 Gang rule is persistent

In leading and well-studied cases of pervasive gang rule like Rio de Janeiro, Medellín, and El Salvador, duopolies of violence throughout urban peripheries has persisted for decades, in the face of massive state crackdowns on criminal groups.

Rio's informal settlements have, almost since their inception around the turn of the 20th century, relied on informal local bosses (*donos*) to provide everyday order, often local authorities or the "bankers" who ran the city's traditional numbers racket (Misse, 2007). Since the 1980s, when the Comando Vermelho (CV) prison gang expanded to dominate the booming retail drug trade operated from Rio's favelas, these bosses have been drug lords, figures demonized by the police and political elites and subject to lethal and increasingly militarized policing (e.g. Leeds, 1996; Zaluar, 1985). Despite more than forty years of such brutal state repression and violent rivalries with other criminal groups, the CV today controls more favela territory than any other single armed group, and dominates the lucrative retail

drug markets of the city's wealthy South Zone.

Similarly, Medellín's low-income *barrios* have been home to street gangs with local governance capacity since at least the mid-1980s, only briefly substituted by guerrilla-linked urban militias in the early 1990s (Martin, 2014). In these and countless other peripheral and low-income communities, generations of civilians have grown up under a duopoly of violence, turning to gangs for some problems and the state for others (Blattman et al., 2024).

El Salvador's *mara* gangs have governed and extorted its poorest neighborhoods since at least the early 2000s, despite the absence of a retail drug market and in the face of extensive militarized repression and world's second-highest incarceration rate (Brown et al., 2022; Amaya and Martínez d'Aubuisson, 2021). Since 2022, President Nayib Bukele has maintained a state of exception suspending civil rights and unprecedented levels of state repression; these seem to have curbed or eliminated criminal governance, at least for the time being.

### 3.3 Criminal governance can pacify urban peripheries at micro and macro scales

While gangs inevitably rely on their coercive power to govern, that does not mean they necessarily use it. On the contrary, effective threats are those not acted on (Schelling, 1966), while the actual use of violence to settle disputes is almost always inefficient, if not always avoidable (Fearon, 1995).

First, criminal governance can pacify illicit markets and broader criminal domains that might otherwise turn to violence in lieu of licit dispute-resolution mechanisms (Skarbek, 2014). Since such violence is inefficient, pacifying illicit markets generates a surplus which governing criminal authorities are then in a position to extract (Lessing, 2010). Second, criminal governance over civilians—gang rule—can help adjudicate normal disputes that could otherwise lead to sporadic, atomistic violence, and ban forms of inter-personal violence under threat of punishment. This prevents locals from calling the police.

Both these factors are particularly important with respect to retail drug markets. These markets can be enormously profitable, but those profits can evaporate through violent competition, or through police repression of retailing points of sale. Preventing property crime near retail points of sale is also critical to maximizing sales and hence profits.

In Brazil, for example, the spread of prison-based "factions" like Rio's CV and São Paulo's Primeiro Comando da Capital (PCC) has transformed the local structure of organized crime, with myriad street gangs being subsumed into a handful of larger, prison-based structures. These organizations developed sophisticated governance institutions and practices within

prison (Dias, 2013; Coelho, 1987), which they then applied at scale across urban peripheries (e.g. Lessing and Denyer Willis, 2019).

In places like São Paulo where only one major gang exists, the result has been unprecedented drops in homicide rates (Biderman et al., 2019). From a high of 66 per 100,000 in 1999, the homicide rate fell to 16.2 by 2008 and edged steadily downward since, averaging 13.9 between 2011 and 2016 (were it an American city, it would rank #18 for this period, just below Tulsa and well behind Chicago). In other places where a handful of dominant gangs have managed to reach non-aggression pacts and truces, like El Salvador (Cruz and Durán-Martínez, 2016) and the Brazilian state of Ceará (Barros et al., 2018) similar drops have been observed, though they are often followed by spikes when truces break down.

## 3.4 Gangs vary in how much they tax (i.e. extort) residents

A long literature noting parallels between organized crime and states (e.g. Skaperdas and Syropoulos, 1997; Levi, 1989; Tilly, 1985), suggests that both seek, above all, to maximize tax revenue. Indeed, this is the spirit of the "stationary bandit" theory (Olson, 1993) and model (McGuire and Olson, 1996) that I use as a foundation for the formal analysis to come.

At the same time, classic literature on organized crime has focused heavily on protection rackets, going so far at times as to define organized crime as governance over other criminal actors and markets (Schelling, 1967; Gambetta, 1993). Yet many street gangs—often far less articulated than traditional mafias—nonetheless come to exert governing authority over civilians, in particular providing local order, enforcing property rights, and resolving disputes. Some use this power to "tax" (some would say extort) residents , but many do not.

Rio de Janeiro is again illustrative. There, the CV and its rival prison-based factions operate the retail drug trade out of the favelas they control. They provide significant local governance, generally banning property crime, domestic violence, rape and pedophilia, and enforcing community norms (Leeds, 1996; Dowdney, 2003). Yet they traditionally charged no taxes to residents, presumably to win their loyalty and avoid being ratted out to police. In contrast, police-linked *milícia* groups that profess to keep the drug trade out of the communities they dominate rely instead on direct taxation (Arias and Barnes, 2017). Over time, it is true, these two types of group seem to be converging, with some *milícias* selling drugs and some drug gangs charging extortion as a recent survey of residents from nearly 200 favelas (Lessing et al., 2022) reveals. Nonetheless, while all drug gangs deal drugs and almost all *milícias* tax local businesses, only a third of drug gangs tax businesses and less than 30% of *milícias* sell drugs (Figure 1). When the CV recently conquered several *milícia*-held neighborhoods, it told residents they would no longer be taxed. These data points

Table 4: Protection fee charged by criminal group (%)

| | Business | | Residents | |
|---|---|---|---|---|
| | N favelas with information | Percent | N favelas with information | Percent |
| Drug gangs | 93 | 33.3% | 93 | 10.7% |
| Milicia groups | 75 | 98.6% | 76 | 68.5% |
| Total | 168 | 62.5% | 169 | 36.7% |

*Note:* This table shows the % of "Yes" answered to the question "Does the business at this favela pay protection fee?" and "Does the residents at this favela pay protection fee?". The denominator only considered valid answers, where we excluded the "Don't Know" and "Missing".

**Figure 1.** Lessing et al. (2022) find that drug retailing gangs rarely extort residents, while *milícia* protection rackets tax widely but rarely sell drugs.

strongly suggests that gangs face a strategic tradeoff between maximizing tax revenues vs. drug profits, and that taxation erodes loyalty.

## 3.5 Conventional wisdom maps poorly onto empirical patterns of criminal governance

A rough conventional wisdom has it that organized crime grows strong where the state is absent or weak. Obviously, there is truth to this: we see piracy making a comeback off the coast of Somalia, not Sweden. And yet at various scales we can observe the opposite pattern. Brazil is among the stronger states in Latin America, but has its largest and most powerful prison gangs, which have come to govern urban peripheries throughout the country. Similarly, El Salvador has the strongest and most organized *mara* gangs in Central America, but is not obviously a weaker state than Guatemala or Honduras. Subnationally, São Paulo is Brazil's financial and economic hub, with its largest police force and prison system, but is also home to by far its most powerful criminal organization. Medellín is a higher-capacity state than Cali, but its gangs govern far more.

At the micro scale, recent findings have significantly undermined or qualified the conventional wisdom. In Medellín, Blattman et al. (2024) conduct a quasi-experimental analysis of redrawn administrative boundaries, finding that an exogenous increase in the proximity of a street block to state agencies is associated with an increase in endline strength of gang governance. Meanwhile, Uribe et al. (2025), analyzing the cross-national Latinobarometro 2020 survey data, show that while the reported presence of criminal groups overall is associated with lower reported income, trust in government, and education level, the direction

Table 2: Correlates of living with criminal presence and under criminal governance

| | Criminal presence | | | Criminal governance | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Confidence in government | -0.044*** | | | 0.061*** | | |
| | (0.008) | | | (0.017) | | |
| Local gov. is responsive | | -0.051*** | | | 0.051*** | |
| | | (0.008) | | | (0.015) | |
| Police are corrupt | | | 0.054*** | | | -0.042*** |
| | | | (0.009) | | | (0.016) |
| Male | 0.013* | 0.015** | 0.004 | 0.008 | 0.008 | 0.001 |
| | (0.007) | (0.007) | (0.008) | (0.013) | (0.013) | (0.015) |
| Age | -0.001*** | -0.001*** | -0.001*** | -0.002*** | -0.002*** | -0.002*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Education | 0.021*** | 0.021*** | 0.018** | -0.027*** | -0.027*** | -0.019* |
| | (0.006) | (0.006) | (0.008) | (0.010) | (0.010) | (0.011) |
| Unemployed | 0.019 | 0.020 | 0.023 | 0.018 | 0.017 | 0.009 |
| | (0.012) | (0.012) | (0.016) | (0.020) | (0.020) | (0.023) |
| Salary covers needs | -0.047*** | -0.047*** | -0.050*** | 0.032** | 0.033** | 0.035** |
| | (0.008) | (0.008) | (0.010) | (0.013) | (0.013) | (0.015) |
| City FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 18,517 | 18,517 | 12,817 | 6,159 | 6,159 | 4,822 |
| $R^2$ | 0.25 | 0.25 | 0.28 | 0.27 | 0.27 | 0.30 |
| Within $R^2$ | 0.008 | 0.009 | 0.008 | 0.010 | 0.009 | 0.008 |

*Standard errors clustered within cities. Signif. Codes: ***: 0.01, **: 0.05, *: 0.1. Universe is all respondents for Models 1-3, respondents who report criminal presence for Models 4-6.*

**Figure 2.** Uribe et al. (2025) find a *positive* correlation between criminal governance and survey questions associated with state capacity.

of correlation is reversed for reported presence of *governing* criminal groups (Figure 2), a correlation that persists for objective measures of state presence.

# 4 Analytic Framework

What explains persistent duopolies of violence? Under the "null hypothesis", states lack the capacity to monopolize; in my argument, they lack the incentives. To arbitrate between these, I develop a modeling framework inspired by Staniland's (2012, 244) conjecture that states and armed groups "are not simple-minded maximizers of monopoly but instead optimizers of authority."

A key claim of my argument is that duopoly can generate net fiscal benefits over monopoly. The formal models proper thus compare the state's fiscal payoffs (and other outcomes of interest) under duopoly—in one-shot strategic interactions with a gang—versus monopoly. Since these are the focus of this article, I label them $U_s^D$ and $U_s^M$. To fully capture the state's "choice" (or lack thereof) between regimes, the broader framework adds two sets of unmodeled costs. First, duopoly likely generates political costs for state leaders ($\pi^D$), possibly including public opprobrium, a concern for those under gang rule, and difficulty implementing policy goals beyond law enforcement. Conversely, a leader stands to reap $\pi^D$ for successfully monopolizing (as, say, Bukele did in El Salvador).[3] To do so, however, incurs one-off "transition costs" ($\tau^M$), which—if the state is truly unable to monopolize—are infinite. More realistically, $\tau^M$ could be very high, if monopolization requires lengthy, violent confrontations with significant collateral damage to civilians. $\tau^M$ does not include the ongoing costs of governance provision once monopoly is established; these are accounted for in the model, and are precisely what the state saves on under duopoly.[4]

Duopolies persist if $U_s^D - \pi^D > U_s^M - \tau^M$, which is consistent with either explanation. The null hypothesis amounts to the claim that were it not for transition costs, the inequality would be reversed,

$$U_s^M > U_s^D - \pi^D \qquad (H_0)$$

leading to monopolization.[5] Thus high transition costs are a necessary condition for the null

[3]Here, I treat $\pi^D$ as an exogenous parameter outside the model; future research could endogenize it in different ways. For example, in Lessing (2026), I argue that hardline drug repression lowers political costs by giving leaders an appearance of "doing something". In the model, drug repression is a choice variable, $P_s$; my claim says that $\frac{\partial \pi^D}{\partial P_s} < 0$.

[4]In practice, the distinction is blurry: a monopolizing state may need to win (back) residents' loyalty and establish legitimacy after decades of neglect and abusive policing. Nonetheless, some distinction is necessary; otherwise, blaming transition costs for duopolies becomes tautological and unfalsifiable.

[5]Of course, if we count avoiding $\tau^M$ among the benefits of accepting duopoly, comparing $U_s^M \lessgtr U_s^D - \pi^D + \tau^M$, we all but guarantee a hollow victory for the claim that duopoly persists because states "prefer"

hypothesis: $\tau^M > U_s^M - (U_s^D - \pi^D) > 0$. Note too that if monopoly is fiscally superior to duopoly ($U_s^M > U_s^D$), then $H_0$ *must* be true (since we agree that duopoly generates *some* political costs—i.e. $\pi^D \geq 0$). As the model shows, this is often the case: monopoly avoids overtaxation and under-provision of governance, thus "recovering" the Weberian conventional wisdom.

Yet the model also shows that duopoly *can* produce net fiscal benefits, if gangs have lower costs of governance provision or access to illicit rents to fund it. Shared projects of governance, formally defined, occur when these benefits outweigh political costs, such that the state would have no incentive to monopolize even if transition costs were zero:

$$U_s^D - \pi^D > U_s^M \qquad (H_{SPG})$$

In sum, net fiscal benefits ($U_s^D > U_s^M$) and low political costs under duopoly are jointly necessary for $H_{SPG}$, while high transition costs are necessary for $H_0$. In the book project from which this paper flows, I argue that $\pi^D$ is kept manageable through crime–state modi vivendi, and provide evidence that $\tau^M$ is low in practice.[6] In this paper, I focus on the value of $U_s^D - U_s^M$; when positive, the state reaps net fiscal benefits from duopoly. Though this a necessary but insufficient condition for $H_{SPG}$, I will sometimes shorthand it by saying the state prefers duopoly. More accurately, the larger $U_s^D - U_s^M$, the larger the fiscal gap the state would have to make up if it transitioned to monopoly, and hence the more likely $H_{SPG}$ is to hold.

# 5 Duopolies of Violence as Dual Stationary Bandits

A rich modeling literature has built off Schelling's (1971, 74) notion of "organized crime as monopolized crime" and Tilly's (1985) identification of states as glorified protection rackets; topics include "Gangs as Primitive States" (Skaperdas and Syropoulos, 1997), "The Market for Protection and the Origin of the State" (Konrad and Skaperdas, 2012), and even "Rival Klepotocrats: the Mafia versus the State" (Grossman, 1995). Though insightful, none quite fit the substantive problem at hand. Some follow Schelling's focus on organized crime as the "government of the criminal underworld" but not civilians. Others portray governance

it.

[6] Unlike in rebel governance (Arjona et al., 2015), criminal groups are rarely able to physically prevent the state from entering their turf. As I touch on below, even against Rio de Janeiro's startlingly well-armed gangs, the state wields an overwhelming military advantage. This was made clear during the UPP/Pacification program, in which state forces quickly occupied hundreds of favelas, often without firing a shot; what proved unsustainable was governing these "pacified" territories in the long run (e.g. Menezes, 2015; Lessing, 2018). These high and ongoing costs of state governance are precisely what, in the model, can lead to $U_s^M < U_s^D$.

providers, whether state or criminal, as pure competitors in a market duopoly (e.g. Blattman et al., 2024).

Duopolies of violence, however, differ fundamentally from market duopolies (Skaperdas, 2001). First, market-duopoly models assume that consumers have choice, when in reality both states and gangs rely on coercive taxation. Second, market models assume that governance provision is excludable. While this assumption may hold for for some gang-provided services (e.g. selective protection of paying businesses, or fee-based dispute-resolution), it ignores the public (non-excludable, non-rival) nature of basic social order, and hence any possibility that the state could benefit from gang-provided order (and vice-versa). Critically, participants in market duopolies—including the state in "markets for protection"—always prefer a monopoly; conversely, market duopolies produce weakly better social outcomes than monopoly—in this case larger quantities of governance provided at lower costs (i.e. tax rates). While a model of duopolies of violence should not rule out such outcomes, neither should it guarantee them. Finally, a market model cannot make sense of cases in which gangs provide governance but do not tax at all. This corresponds to a "price" of zero and hence would require essentially infinite gang governance and zero state governance for the market to clear.

To address these issues, I take a political economy approach. The baseline is McGuire and Olson's (1996) model of stationary banditry (henceforth MO), which shows how even purely self-interested ("autocratic") leaders have an "encompassing interest" in growing the pie that they tax, and so moderate tax rates and provide costly public goods. MO compare this baseline to more "democratic" states whose objective functions align more closely with social welfare; the latter have greater "encompassing interest" and hence set lower tax rates and provide more public goods.[7]

I move in the other direction, comparing MO's baseline (here conceived of as Weberian monopoly) to a modified version with two stationary bandits, state and gang. I assume both are "autocratic"—maximizing revenues minus outlays—and that they tax and provide public goods (i.e. governance) to the same subject population. This overlap reduces each bandits' encompassing interest, leading to higher total taxes and, if their costs of governance are equal. less governance provision, creating deadweight losses. The model thus "recovers the baseline"—the Weberian intuitions that states have incentives to monopolize, and that such monopolization is welfare improving—while providing a framework for exploring conditions under which these incentives are weakened or inverted. Following the blueprint laid out in

[7]MO first model a "consensual" democracy without redistribution, which amounts to a state that maximizes social welfare as they define it. They then examine states that redistribute from the population to a subset of the population; these turn out to form a continuum between the autocratic state (who redistributes from everyone to himself) and full consensual democracy.

Blattman et al. (2024), I start with a "workhorse" model of stationary banditry, then add a retail drug market in which resident loyalty protects drug profits, and gang governance increases loyalty. Unlike Blattman et al. (2024), I treat the state as a strategic actor throughout, and specify a drug-market model in which gang taxation reduces resident loyalty (and hence drug profits).

I first recapitulate MO's original model as a baseline, then add the second stationary bandit. Throughout, I make use of the following notation: Players are the state ($S$) and a criminal organization ($C$) or "gang". The payoffs to stationary banditry for each player $i \in \{s, c\}$ are abbreviated by $E_i$; those of the drug market as $D_i$, and total utility $U_i = E_i + D_i$. Additional notation is adapted from MO: $G = G_s + G_c$ represents total and each player's governance (i.e. public goods) provision, respectively, while $t = t_s + t_c$ represents the total and each player's tax rate respectively. Payoffs and optima under different regimes (monopoly, duopoly) and solution concepts (Nash, Stackelberg) are differentiated with superscripts, e.g. $U_s^M$ vs. $U_s^D$.

## 5.1 Baseline: MO's Autocratic Stationary Bandit

### Setup

- The state ($S$) makes two independent choices, setting a level of governance provision ($G_s$) at a unit cost of $k_s$ and a uniform tax rate $t_s \in [0, 1]$.
- Potential economic output $Y$ is increasing and concave in the total amount of governance provided $G$ (which here equals $G_s$ since there is only one stationary bandit), and no production is possible without *some* governance. That is, $Y(0) = 0$, $Y'(G) > 0$, and $Y''(G) < 0$. It is also convenient to assume that $Y'(0) = \infty$.
- Taxation distorts economic activity. Following MO, let $1 - r(t)$ represent the "deadweight loss function" of taxation, where $t$ is the total tax rate (here simply equal to $t_s$), and $r(t) \in [0, 1]$, so that realized GDP is equal to $r(t_s) \cdot Y(G_s)$. Assume $r$ is continuously differentiable and that higher taxes produce more distortion ($r' < 0$), that zero taxes produce no distortion at all ($r(0) = 1$), that tax rates of 100% deter all economic production ($r(1) = 0$ ). This guarantees an interior solution. I use functional forms in which $r$ is weakly concave $r'' \leq 0$ to ensure a unique solution fully characterized by first-order conditions (and rule out mixing when we add a second bandit below).

The state's maximization problem is given by:

$$\max_{t_s, G_s} U_s^M = t_s r(t_s) Y(G) - k_s G_s \tag{1}$$

Where $k_s$ is the state's per unit cost of $G$. As the FOC for Equation 1 with respect to $t$ makes clear, $S$ sets taxes independently of the equilibrium level of governance provision, by construction:

$$\frac{\partial U_s^M}{\partial t_s} = \quad (r(t_s) + t_s r'(t))\, Y(G) = \quad 0$$

Since $Y(G) > 0$ for all $G > 0$, this FOC implies that $r(t_s^*) + t_s^* r'(t_s^*) = 0$ regardless of $S$'s optimal choice of $G_s$.[8] $S$ chooses $t_s^*$ such that gains from taxation and the losses due to further distortion of the economy are equal:

$$t_s^* = -\frac{r(t^M)}{r'(t^M)} \equiv t^M \tag{2}$$

$t^M$, the monopoly tax rate, is also the revenue maximizing rate, and is determined by the functional form of $r(t)$.

The state provides governance up to the point were the marginal increase in $Y$ times the share the state is able to extract is equal to the marginal cost of governance production, $k_s$:

$$\frac{\partial U_s^M}{\partial G_s} \quad = r(t) t_s Y'(G) - k_s = 0$$

So in equilibrium, $S$ sets $G_s$ such that:

$$G^M \equiv G_s^* : \; Y'(G_s^*) = \frac{k_s}{t^M r(t^M)} \tag{3}$$

Finally, in equilibrium, the monopolizing state's utility is:

$$U_s^M = t^M r(t^M) Y(G^M) - k_s G^M \tag{4}$$

## 5.2 Duopoly as Dueling Bandits (D)

Here, the state ($S$, "she/her") and a criminal organization ($C$, "he/him") both provide governance to and tax a subject population. I compare the state's payoffs to those under Weberian monopoly ($U_s^D$ vs. $U_s^M$) along with total governance provision ($G^M$ vs. $G^D$) and

[8] And since $Y'(0) = \infty$, $G_s^* > 0$

social welfare. These can all diverge from one another.

**Setup**

- Players $i \in \{S, C\}$ choose levels of public-goods provision ($G_i$) and tax rates ($t_i \in [0, 1]$). I use simultaneous-choice (Nash) solutions in the main text, and show that results are identical under Stackelberg. This is not true in the drug-market iteration below, where I consider each solution concept separately.

- Tax-induced distortion $r(t)$ depends on the total amount of taxes levied: $t \equiv t_s + t_c$. As before: $r(0) = 1$ and $r'(t) < 0$. The additivity of tax distortion here mirrors that of local, state, and federal taxes. As before, I assume $r'' \leq 0$.

- Potential economic output $Y$ now depends on both actors' public good provision. Assuming constant elasticity of substitution, we can write a general form: $Y(G_s, G_c) = (G_S^{\mu} + G_C^{\mu})^{\frac{\nu}{\mu}}$ where $\mu \in (0, 1]$ captures the degree of complementarity, and $\nu \in (0, 1)$ ensures diminishing returns and interior solutions. As before, $Y(0, 0) = 0$, and $Y'(G_i)_{i \in \{S,C\}} \geq 0$, and $Y''(G_i)_{i \in \{S,C\}} < 0$.

Since gangs rarely provide important classes of public goods like education, health, and major infrastructure, $G$ is probably best of as basic social order, including property rights and dispute resolution—which gangs do often provide. Thus possible extensions include relative weights on $\{G_s, G_c\}$ and addition terms in $Y(\cdot)$ for public goods that only the state can provide. Still, this specification is general enough to explore complementarities between state and gang order-provision such as when state homicide investigators rely on tips or cooperation from gangs (e.g. Denyer Willis, 2015). For the baseline model developed in this section, it provides a closed-form interior solution, as I show in Appendix 2 .

In the main text, I abstract from complementarity and focus on the limit case where $\mu = 1$, so that $Y(G_s, G_c) = (G_s + G_c)^{\nu}$ and state and gang governance are perfect substitutes, for a few reasons. Fixing $\mu = 1$ puts analytic focus on parameters with greater substantive resonance, especially the relative cost of governance provision for the state vs. the gang, and is a more plausible assumption than high complementarity. Moreover, $\mu < 1$ requires re-specifying Weberian monopoly, since the state would now need to supply some of both inputs, muddying the conceptual waters. Finally, it keeps things tractable when I bring in the retail drug market in Section 6. I write $G \equiv G_s + G_c$ for concision.

Players' utility functions and maximization problems are symmetrical:

$$U_i^D = E_i = t_i \cdot r(t_i + t_j) \cdot Y(G_i + G_j) - c_i G_i \text{ for } i, j \in \{s, g\} \tag{5}$$

Two critical implications of this specification are immediately clear:

$$\frac{\partial U_i^D}{\partial t_j} < 0, \quad \frac{\partial U_i^D}{\partial G_j} > 0$$

That is, each player is hurt by increases in the others' tax rate, but benefits from increases in the other's governance provision. This is the opposite of what occurs in market duopolies (including "markets for protection" models) where, by construction, players are hurt by increases in the others' "provision" (i.e. supply) and benefit from increases in the other's "tax rate" (i.e. price).

As in the baseline model, the two maximization problems can be solved sequentially, starting with taxation.

### Optimal taxation with dual bandits

**Lemma 1.** *In equilibrium, players' optimal tax rates are identical:*

$$t_s^* = t_c^* \equiv t^D = -\frac{r(2t^D)}{r'(2t^D)}$$

.

See proof on page A1. Informally, as $i$ raises $t_i$ he gets a larger share of a smaller pie. These two effects must be of equal size at the optimum $t_i^*$. But the negative effect on the size of the pie is the same whether $i$ or $j$ is raising their rate. Therefore, the increase in $i's$ share at $t_i^*$ must be the same as the change in $j's$ share if she were to raise *her* rate. But these "shares" are just each player's chosen tax rate. So these must be equal.

The overall tax rate under dual bandits is higher than under a unitary stationary bandit. First, note that regardless of how many stationary bandits there are, the revenue maximizing total tax rate remains a pure function of $r$:

$$\hat{t} = \max_t t \cdot r(t) = -\frac{r(\hat{t})}{r'(\hat{t})} = t^M \tag{6}$$

Although this rate is not necessarily optimal for any player in the dual bandit model (hence the hat over $\hat{t}$), it is the same rate that a monopoly stationary bandit chooses.

**Proposition 1.** *The total tax rate under duopoly exceeds the revenue-maximizing tax rate under Weberian monopoly, though each bandit's tax rate is lower. That is,* $t_i^* + t_j^* = 2t^D > t^M$, *but* $t_i^* = t_j^* = t^D < t^M$.

See proof on page A1. Like $t^M$, $t^D$ depends solely on the functional form of $r(t)$.

Since $t^M$ maximizes $tr(t)$ and $r' < 0$, it is clear that $2t^D$ is also neither revenue- nor production-maximizing:

**Corollary 1.** *For any level of governance provision $G_0$, realized economic production and total tax revenues are lower under duopoly. That is: $r(t^D)Y(G_0) < r(t^M)Y(G_0)$ and $2t^D r(t^D)Y(G_0) < t^M r(t^M)Y(G_0)$.*

Corollary 1 points to a commitment-problem type bargaining failure (Powell, 2004) at the heart of duopolies, because a Pareto superior outcome goes unrealized. If both players reduced their tax rates from $t^D$ to $\frac{t^M}{2}$, total tax receipts would be larger—and deadweight loss lower—for *any* positive amount of governance provided. The resulting surplus would make both players weakly better off. Moreover, it would leave citizens' post-tax income—MO's definition of social welfare—higher.[9] However, the players have no way to commit themselves, and if one plays $\frac{t^M}{2}$, the other has an incentive to raise their tax rate *above* $t^D$. Allowing $S$ to move first (i.e. adopting a Stackelberg Equilibrium solution concept) does not alter this result.

That dual stationary bandits tend to overtax their wards beyond the revenue-maximizing, Weberian-monopoly rate highlights similarities and differences with market duopolies. Market firms similarly forego monopoly profits when they fail to collude and set monopoly prices. Yet whereas dueling bandits set taxes too high, market firms set their prices too low, and this price competition *increases* social welfare relative to monopoly. By contrast, competition among stationary bandits leaves everyone, including residents, worse off. Skaperdas (2001) has a similar finding; in his model of competing protection rackets, however, "competition takes place through resources devoted to fighting that become unavailable for production". The result here more closely resembles Shleifer and Vishny's (1993) finding that independent, corrupt state agents taking bribes for complementary permits will overcharge, hurting themselves *and* buyers of the permits; after all, as they note, taxation and corruption can be "sister activities".

The model thus recovers and illuminates some basic Weberian intuitions. Armed actors have incentives to monopolize the use of force—or at least coercive taxation—not just to win a larger share of a "market for protection" (like market firms), but in order to minimize deadweight loss and grow the tax base (unlike market firms). Conversely, the model identifies one key channel through which extra-legal protection rackets lower social welfare: overtaxation. Indeed, as I explore in an extension, a "democratic" $S$ who seeks to maximize

[9] Below, I follow this definition but add additional terms to account for potential externalities associated with duopolies of violence.

social welfare rather than private income could, in some cases, set her own tax rate to 0, inducing $C$ to play $t^M$, precisely to minimize deadweight loss.

**Optimal governance provision with two bandits** Under simultaneous choice, we identify Nash equilibria in which player $i$'s choice of $G_i$ is a best response to player $j$'s choice of $G_j$ and vice versa. Solving FOC for Equation 5 for $G_i$ and $G_j$ yields

$$\begin{aligned} \max_{0 \leq G_i} E_i = & \quad t_i r(t_i + t_j) Y(G_i + G_j) - k_i G_i \\ \frac{\partial P_i}{\partial G_i} = & \quad t_i r(t_i + t_j) Y'(G_i + G_j) - k_i \leq 0 \end{aligned}$$

where the last condition holds with equality if $G_i > 0$. The inequality reflects the fact that player $j$ may provide so much governance that $t_i r(t_i + t_j) Y'(G_j) - k_i < 0$, so $i$ can do no better than setting $G_i = 0$.

We can write players' best response function implicitly; i.e. $\{i, j\}$ wants to set $\{G_i^*, G_j^*\}$ such that:

$$G_i^*(G_j): \; Y'(G_i^* + G_j) \leq \frac{k_i}{t_i^* r(t_i^* + t_j^*)} = \frac{k_i}{t^D r(2t^D)} \tag{7}$$

$$G_j^*(G_i): \; Y'(G_i + G_j^*) \leq \frac{k_j}{t_j^* r(t_j^* + t_j^*)} = \frac{k_j}{t^D r(2t^D)} \tag{8}$$

Equations 7 and 8 intuitively capture a key factor pushing toward lower governance under duopoly. Similar to monopoly, each player wants to provide governance up to the point where the marginal benefits from increased production ($Y'$ times the denominator on the right hand side) equals their marginal cost of governance provision ($k_i$). But under duopoly, each player gets a smaller share of realized productivity gains (since $t^D < t^M$), which are themselves smaller because tax distortion is higher (i.e. $r(2t^D) < r(t^M)$. Smaller denominators make the right-hand sides larger, and since $Y''(G) < 0$, a lower total $G$ is required to satisfy the FOCs. Substantively, speaking, two bandits each have less "encompassing interest" than one, though still enough to provide some costly public goods.

If costs are comparable, the right-hand side of Equations 7 and 8 are larger than in the monopoly case, and since $Y''(G) < 0$, a lower total $G$ is required to satisfy the FOCs. In the limit, if players have equal costs of governance provision, $k_s = k_c = k$, then (because $t_i^* = t_j^* = t^D$) there is a unique total amount of $G$ that is optimal for both players, call it $G^D$:

$$G^D \equiv G^D: \; Y'(G^D) = \frac{k}{t^D r(2t^D)} \tag{9}$$

and there is a continuum of Nash equilibria characterized by $G_s^* = G^D - G_c^*$. In words, players agree on an optimal amount of governance to be provided, and either is happy to provide it up until the total reaches that optimum. Obviously, each prefers that the other provide all the governance, but for any division of optimal total between the two players, neither has an incentive to deviate.However they divide it, total governance is lower than under a monopoly:

$$Y'(G^D) = \frac{k}{t^D r(2t^D)} > Y'(G^M) = \frac{k}{t^M r(t^M)} \tag{10}$$

since, as we saw above, $t^D < t^M < 2t^D$ and $r(2t^D) < r(t^M)$. Then, since $Y'' < 0$, $G^D < G^M$.

The indeterminate outcome for $G_s$ and $G_c$ above is an artifact of the perfect symmetry of the players. Realistically, players' costs of governance provision differ, eliminating the continuum of equilibria and, in this perfect-substitute iteration, leads to the lower-cost player to provide all the governance.[10]

**Proposition 2.** *If $k_i \neq k_j$, the equilibrium level of governance provision is given by:*

$$Y'(G^D) = \frac{\min[k_i, k_j]}{t^D r(2t^D)}$$

*with the lower-cost player providing $G^D$ and the other providing no governance.*

*Proof.* Follows from Equations 7 and 8. □

## 5.3 Monopoly vs. Duopoly: Governance Provision, Social Welfare, and State Preferences

We can now compare regimes in terms of three key outcome variables: how much governance is provided, social welfare (defined below), and perhaps most importantly, which the state prefers. All three turn out to depend crucially on the relative costs of governance provision: $k_c$ vs. $k_s$.

Proposition 2 holds whether $k_s \lessgtr k_c$, but the substantively appropriate and analytically fruitful assumption is that the gang's costs are lower than the state's. In contrast, if $k_s < k_c$, then the state provides all the governance, with the gang merely taxing. As I show below, the

[10]This sort of result is typical when players can each contribute to a public good but have different valuations of it. Roger Meyerson uses the example of two parents agreeing their child needs disciplining, which neither enjoys doing, but disagreeing about just how much is optimal. If parent A's marginal cost of disciplining is higher, she will do no disciplining at all, knowing that B will, in equilibrium, discipline up to and beyond A's own ideal point, no matter what A does.

state provides less governance than under monopoly (because it still sets $t_s^* = t^D < t^M$), and is strictly worse off. Moreover, with higher total taxes and lower total governance provision, society too suffers. Substantively, this neither looks like nor explains persistent duopolies of violence in urban peripheries. Rather, $k_s < k_c$ suggests early state-formation, with $C$ acting more a roving than stationary bandit. Under such conditions, the model captures the Weberian intuition that states have strong incentives to monopolize coercion and eliminate $C$ altogether, to the benefit of society as well as themselves.

I thus focus on cases where $k_c < k_s$.[11] Two questions immediately arise: why would gangs have lower costs of order-provision, and if they do, why doesn't the state simply hire them? Some of gangs' cost advantages are unproblematic and likely could be captured by the state: often socially embedded in communities, their members are usually frequently natives with longstanding personal and familial connections. They are physically present and easy to contact, and so can be more responsive, and they have local knowledge and experience that might make governing easier. So why not just hire them? Beyond political concerns (gangs have been publicly demonized for decades), the problem is that some cost advantages come from gangs' criminal/outlaw nature: they can (and do) employ children, pay below-legal wages, and above all have recourse to physical, even lethal, punishments unconstrained by legal due process.[12] If gangs were deputized, these advantages would evaporate. Moreoever, while gang rule can be harrowing for residents, some seem to deliberately seek out and demand such quick and violent extrajudicial punishment for crimes such as rape and pedophilia (e.g. Gordon, 2020). I return to this point when considering social welfare below. With all this in mind, I assume going forward that $k_c < k_s$.

**Total Governance Provision** With equal costs, we saw that $G^D < G^M$; if the cost difference is marginal (say $k_c = k_s - \epsilon$), the resulting $G^D$ will be similar to the equal-cost outcome, but provided entirely by the gang:

$$Y'(G^D) = \frac{k_c}{t^D r(2t^D)} \approx \frac{k_s}{t^D r(2t^D)}$$

and $G^D < G^M$ still holds. As the gang's relative costs of governance falls, though, it will

[11] In the iteration of the model with a drug market, I show how similarly interesting results can occur with $k_c = k_s$, if the gang can draw on drug profits as a fiscal base of governance provision.

[12] That said, some gangs, like São Paulo's PCC, have deliberately built governance institutions that incorporate public debate and formalized trials, with codified lists of infractions and respective punishments, and queryable "criminal criminal records" for members that minimize the need for physical punishment (Lessing and Denyer Willis, 2019).

eventually provide more governance than the state would under a Weberian monopoly:

$$\lim_{k_c \to 0} Y'(G_c^*) = 0 \Rightarrow \lim_{k_c \to 0} G_c^* = \infty > G^M \tag{11}$$

By continuity, there is some value of $k_c \in (0, k_s)$ such that $G^D = G^M$. Indeed, we can specify it:

$$G^D = G^M \Rightarrow Y'(G^D) = Y'(G^M) \tag{12}$$

$$\frac{k_c}{t^D r(2t^D)} = \frac{k_s}{t^M r(t^M)} \tag{13}$$

$$\frac{k_c}{k_s} = \frac{t^D r(2t^D)}{t^M r(t^M)} \equiv \gamma \tag{14}$$

The term $\gamma$ represents a cutpoint, such that $\frac{k_c}{k_s} > \gamma \Rightarrow G^D < G^M$ and $\frac{k_c}{k_s} < \gamma \Rightarrow G^D > G^M$. Moreover, it is clear from Equation 14 that $\gamma < 1$, which confirms that if $k_c \geq k_s$, total governance is strictly lower undern duopoly. Note that $\gamma$, like $t^M$ and $t^D$, depends only on how $r(t)$ is specified, and not on $Y(G)$.

**Social Welfare** How to compare social welfare under the two regimes? I start by adapting McGuire and Olson's (1996) approach: formalizing social welfare as the portion of realized economic production left untaxed: $(1-t)r(t)Y(G)$. However, there are likely additional welfare costs and externalities specific to duopoly. For one thing, gangs may govern in unaccountable and brutal ways. Even if they do not, living under a duopoly of violence may be a "schizophrenic experience" in which subjects "must navigate a treacherous and shifting landscape of overlapping yet antagonistic authorities" (Lessing, 2021, 868). For conceptual accounting purposes, denote these as $\xi^D(\cdot)$, a function of unspecified variables. This yields:

$$W^M = (1-t^M)r(t^M)Y(G^M) \tag{15}$$

$$W^D = (1-(t_c^* + t_s^*))\, r((t_c^* + t_s^s)\, Y(G^D) - \xi^D(\cdot) \tag{16}$$

It is obvious that if $\xi^D$ is large enough, monopoly is always welfare-improving. Moreover, if the gang's cost advantage stems from "darker" factors like recourse to arbitrary and brutal punishments, then it could be that $\xi^D(\cdot)$ increases as $\frac{k_c}{k_s}$ falls, and the benefits of additional governance are entirely offset by increased social welfare costs. On the other hand, in places like Rio, gangs are often seen by residents as an improvement over abusive, discriminatory, and often corrupt police (Zaluar, 1985; Leeds, 1996; McCann, 2013). Given this empirical ambiguity, I remain agnostic about the size of $\xi^D$ and focus on the fiscal costs and benefits

explicitly modeled here. In the present iteration of the model, this yields:

$$W^D = \left(1 - 2t^D\right) r(2t^D) Y(G^D) \tag{17}$$

As suggested above, for $\frac{k_c}{k_s} \geq 1$ , it is clear that $W^M > W^D$, since total taxes are lower and governance provision higher. But for $\frac{k_c}{k_s} < 1$, $W^D$ is increasing in $G_c^*$, and so by Equation 11, grows as $k_c$ falls:

$$\lim_{k_c \to 0} G_c^* = \infty \Rightarrow \lim_{k_c \to 0} W^D = \infty \tag{18}$$

By the same logic as above, we can define a cutpoint $\omega \in (0, 1)$ such that $\frac{k_c}{k_s} = \omega \Rightarrow W^D = W^M$. At lower cost ratios, $\frac{k_c}{k_s} < \omega$, enough governance is provided under duopoly to make up for overtaxation and social welfare is higher than under monopoly. (Note that this excludes non-fiscal costs and externalities of duopolies, $\xi^W$; including these would shift the value of $\omega$ down, requiring even lower $\frac{k_c}{k_s}$ and higher equilibrium criminal governance to compensate.) Several results immediately follow:

**Lemma 2.** $\frac{k_c}{k_s} > \omega \Rightarrow W^D < W^M$, *and* $\frac{k_c}{k_s} < \omega \Rightarrow W^D > W^M$

See proof on page A2.

**Lemma 3.** $\omega < \gamma$*; that is,* $\frac{k_c}{k_s} = \gamma \Leftrightarrow G^D = G_M \Rightarrow W^D < W^M$.

*Proof.* Since $t^M < 2t^D$ and $r' < 0$, the first two terms in $W^D$ are strictly lesser than the corresponding terms in $W^M$, while the final terms are equal. □

Intuitively, since total taxes are higher under duopoly, social welfare can only be higher under duopoly if governance is higher.

**Fiscal benefits (i.e. S's utility)** Finally, as with social welfare and total governance, we can compare the state's equilibrium payoffs under the two regimes and identify a cutpoint $\rho$ below which $U_s^D > U_s^M$ such that the state is fiscally better off under duopoly—here shorthanded as "prefers".[13] Recall that:

$$U_s^M = t^M r(t^M) Y(G^M) - k_s G^M; \quad U_s^D = t^D r(2t^D) Y(G_s^* + G_c^*) - k_s G_s^*$$

[13] As discussed above, $U_s^D < U_s^M$ guarantees net fiscal benefits, a necessary but insufficient condition for truly preferring duopoly. Since duopoly also imposes unmodeled political costs $\pi^D$, the full condition is $U_s^D - U_s^M > \pi^D$; in practice, $\pi^D$ seem manageable, and arbitrarily specifying a value would neither change nor illuminate the analysis here.

If $\frac{k_c}{k_s} > 1$, $S$ provides all the governance under duopoly, leaving her strictly worse off than under monopoly.[14] When $k_c < k_s$, though, the gang provides all the governance, and as we saw above, it may provide more than the state would under monopoly. Since $U_s^D$ is strictly increasing in $G_c^*$, it too increases as $k_c$ falls:

$$\lim_{k_c \to 0} U_s^D \to \infty > U_s^M \tag{19}$$

and we can once again define a cutpoint, call it $\rho$, such that $\frac{k_c}{k_s} < \rho \Rightarrow U_s^D > U_s^M$. That is, if the relative cost of gang governance provision is below $\rho$, the state "prefers" duopoly to a monopoly.

**Malign outcomes and low-governance traps.** Bringing in $\gamma$ and $\omega$, I identify conditions for *malign outcomes* in which the state "prefers" the regime with lower social welfare; *low-governance traps'* in which it "prefers" the regime that provides less governance; and the overlap among these categories.

First note that all three cutpoints, $\gamma$, $\omega$, and $\rho$ are simply real numbers $\in (0, 1)$, not choice variables or parameters. Like $t^M$ and $t^D$, their values are determined by the functional forms of $r(\cdot)$ and (in the case of $\omega$ and $\rho$) of $Y(\cdot)$, not by parameter values for $k_c$ and $k_s$.[15] So too are their ordinal relationship to one another: with the exception that $\omega$ is always less than $\gamma$, any arrangement of the three cutpoints is possible. Excluding equalities, this yields three logical possibilities. The following table demonstrates that all three are possible, providing numerical examples using the family of functional-form specifications: $r(t) \equiv 1 - t^n$ and $Y(G) \equiv (G)^{\frac{1}{m}}$, where $n > 0$ and $m > 1$.

| | $n$ | $m$ | $\omega$ | $\rho$ | $\gamma$ |
|---|---|---|---|---|---|
| Case 1: $\omega < \gamma < \rho$ | 2 | $\frac{3}{2}$ | 0.331 | 0.539 | 0.459 |
| Case 2a: $\omega < \rho < \gamma$ | 1 | 2 | 0.198 | 0.395 | 0.444 |
| Case 2b: $\rho < \omega < \gamma$ | 20 | 3 | 0.288 | 0.270 | 0.493 |

These cases are illustrated in Figure 3. Perhaps the best outcomes are at the far right, when $\frac{k_c}{k_s}$ is greater than $\rho$ and $\gamma$ (and hence $\omega$): the state "prefers" monopoly, which provides the greatest governance and social welfare. Somewhat less good, one imagines, is the opposite outcome on the far left, when $\frac{k_c}{k_s}$ is less than $\gamma$, $\rho$, and $\omega$. Here, the state prefers duopoly,

[14] To see this, imagine that, from the duopoly equilibrium outcome, $C$ were artificially constrained to $t_c = 0$ before $S$ could adjust. $U_s^D$ would mechanically rise, since $r(t^D) > r(2t^D)$. But then $S$'s optimal strategy would change too: by raising $t_s$ from $t^D$ to $t^M$ and raising $G_s$ from $G^D$ to $G^M$, she would further increase her payoffs. Thus $U_s^M > U_s^D$. (At $k_s = k_c$ the situation is ambiguous, though it is clearly the case that $S$ is worse off under duopoly if she ends up providing all the governance.)

[15] Because both $\rho$ and $\omega$ depend on $Y(\cdot)$, they are difficult if not impossible to characterize in open form.

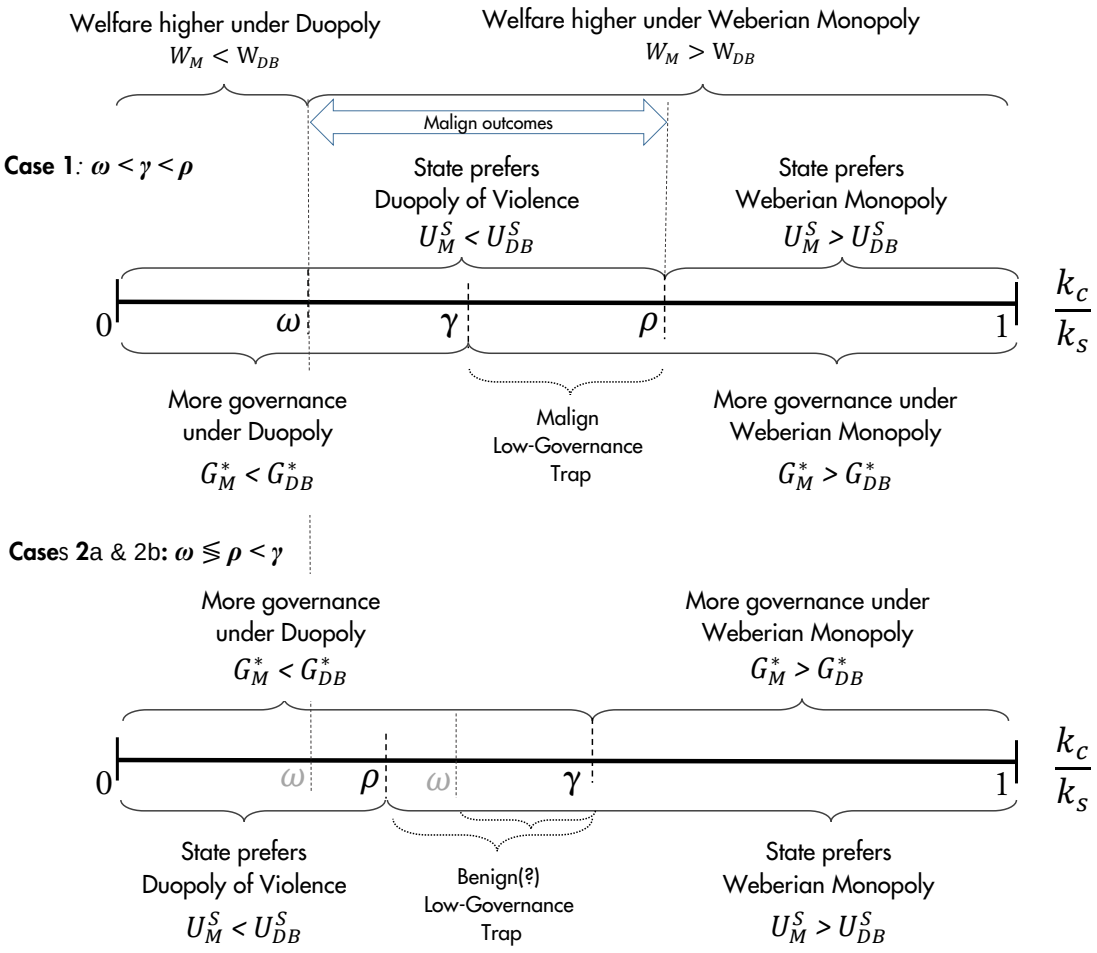



**Figure 3. Monopoly vs. Duopoly: Low-Governance Traps and Malign Outcomes.** The ratio of the gang's and state's costs of providing governance, $\frac{k_c}{k_s}$, determines which regime generates more governance, more social welfare, and more utility for $S$. For each, let the respective point of equality be called $\gamma, \omega$, and $\rho$. The cutpoint for social welfare, $\omega$, is strictly less than $\gamma$ (there must be more governance under duopoly in order for it to be socially preferable), but other relationships depend on functional forms. if $\frac{k_c}{k_s}$ lies between $\omega$ and $\rho$ (whichever is greater), we get a "malign outcome": the state prefers the regime with lower social welfare. Likewise, if $\frac{k_c}{k_s}$ lies between $\gamma$ and $\rho$, we get a "low-governance trap": the state prefers the regime with lower $G$. In Case 1, $\gamma < \rho$ and since $\omega < \gamma$, any low-governance trap is sure to be malign. In Cases 2a and 2b, $\rho < \gamma$; here, $\frac{k_c}{k_s} \in (\rho, \gamma)$ implies the state prefers Weberian monopoly even though it produces less governance; this trap may be benign or malign, depending on the location of $\omega$.

but at least total governance and social welfare are higher than in a Weberian monopoly. These outcomes hold regardless of whether $\gamma \lessgtr \rho$ and $\omega \lessgtr \rho$.

The divergence of $\omega$ from $\rho$ (that is, the fact that the state is not welfare-maximizing) makes "malign outcomes" possible: if $\frac{k_c}{k_s}$ lies between $\omega$ and $\rho$ (whichever is greater), the state prefers the regime with lower social welfare. By the same token, the divergence of $\gamma$ from $\rho$ makes possible what I call "low-governance traps"; if $\frac{k_c}{k_s}$ lies between $\gamma$ and $\rho$, the state prefers the regime with less total governance provision. These two possibilities come together in Case 1, where $\gamma < \frac{k_c}{k_s} < \rho$ produces an unambiguously malign low-governance trap: the state prefers duopoly even though less governance is provided and society is worse off. This worst-case scenario is possible because, even though the state is getting a smaller slice ($t^D < t^M$) of a smaller pie ($Y(G^D) < Y(G^M)$), it is not paying for $G$.

In Case 2, $\rho < \gamma$, and low-governance traps may not be all bad. Here, $\frac{k_c}{k_s} \in (\rho, \gamma)$ implies that the state prefers a monopoly even though total governance under duopoly would be higher. Depending on where $\omega$ falls, at least some possible low-governance traps are benign. In Case 2b, with $\rho < \omega$, monopoly low-governance traps can be malign: the state prefers monopoly even though duopoly would provide more governance and improve social welfare.

In Case 2a, with $\omega < \rho < \gamma$, all low-governance traps are benign. On the other hand, if $\frac{k_c}{k_s}$ falls along the interval $(\omega, \rho)$, or in Case 1 the interval $(\omega, \gamma)$, the state prefers duopoly, and duopoly produces more governance, yet residents are worse off than they would be under monopoly. This is because residents, though they get (somewhat) more governance than they would from the state under monopoly, are doubly taxed. This is not a trivial point: it shows that even if we assume no additional psychological or political costs of living under a duopoly ($\xi^D = 0$), and even when the gang's low cost of governance provision leads to great equilibrium governance, the deadweight loss of predation by dual bandits can lower total social welfare.

**Empirical example: El Salvador** Nayib Bukele's 2022 crackdown on *mara* gangs is an exceedingly rare example of a state apparently eliminating gang rule and establishing a Weberian monopoly. Given the popularity this crackdown won him (he won a landslide reelection in 2024), it is a puzzling why no Salvadoran leader did this earlier. One answer is that they faced daunting one-time transition costs ($\tau^M$), though the state directed extreme repressive force at the *maras* from 2015 onward without monopolizing. The model offers an alternative explanation: leaders benefited from the governance *maras* provided, and avoided the steep fiscal costs of providing governance on their own under monopoly. This includes Bukele himself, who from 2019-22 negotiated secret, violence-reducing pacts with the *maras* rather than directly confront them.

To explain the timing of Bukele's crackdown, scholars of El Salvador point to his consolidation of authoritarian control, after his party won a Congressional supermajority in 2022, allowing him to suspend civil rights (Meléndez-Sánchez and Vergara, 2024). In the model's terms, this would win for the state some of the cost advantage previously held by gangs, bringing $\frac{k_c}{k_s}$ closer to 1. As Figure 3 shows, such rightward movement could shift the state's preference from duopoly to monopoly. Of course, transition costs ($\tau^M$) likely also fell, and surely contributed to his decision. Nonetheless, his vocal complaints about the ongoing fiscal costs of his megaprisons when negotiating a deal with Donald Trump to house deportees suggests that transition costs alone were not decisive.

# 6 Adding an Illicit Drug Market

I introduce a general framework for integrating an illicit-drug retail market into the model, with some minimal assumptions. Below I put additional structure on the drug market to solve and analyze it.

Evidence suggests that a prime motive for criminal governance is protecting or maximizing profits from drug retailing (Blattman et al., 2024; Lessing, 2021). Providing governance can can increase gangs' bottom line in several ways: directly, by (A) reducing police presence (since there are fewer crimes to respond to), and (B) increasing sales by making potential customers feel safer (both from property crime and police raids); and indirectly, via winning the loyalty of residents, who can play a critical role in protecting the gang's profits from policing, by (C) not reporting the gang to the police or calling the police to deal with other issues, and (D) tipping off or hiding the gang when the police do come in. Conversely, disloyal residents can serve as key police informants, indicating hideouts and stashes, thus vastly reducing the gang's share of drug profits lost to repression. Presumably, preserving resident loyalty is one, perhaps *the*, reason that some drug gangs refrain from taxation entirely.

To capture these dynamics, this section integrates a drug market into the baseline model of stationary banditry in a way that ties the gang's governance provision *and* taxation to its profits from the drug trade. At the same time, it introduces significant asymmetry between state and gang, by assuming that neither state governance nor taxation directly affects the gang's drug profits; rather, I introduce state policing ($P_s$) as a distinct choice variable. Though our instincts may be to assume as little about the players as possible, central to the dynamics of criminal governance are the asymmetries between state and gang.

Such asymmetries are particularly relevant for retail drug markets. The state directly represses such markets through policing; this is reasonably modeled as a different activity than providing governance, since it may involve heavily armed and often lethal police raids that do little for residents. For the gang, citizen loyalty is likely to be a primary defense against such policing, and governance probably increases citizen loyalty. Another asymmetry exists with respect to taxation: gangs "tax" through direct, coercive contact with residents, whereas the state taxes in more indirect ways, particularly in low-income settings (mostly through VATs, fees, and taxes on financial transactions). Thus we would expect an increase in gang tax rates to directly reduce loyalty, and hence drug profits, whereas an increase in state tax rates might not.

Finally, if we want to explore the state's incentives to live with criminal governance, we need to make a meaningful comparison to a Weberian monopoly. This requires additional structure beyond the original dual-bandit model above: there, where all gangs do is govern

and tax, it is simple to imagine a world without them. But where gangs sell illicit drugs *and* govern, what does the counterfactual Weberian monopoly look like? Presumably, the drug market still exists (it certainly does in developed countries usually understood to have Weberian monopolies). The gang still makes drug profits—hurting the state enough that it polices the drug trade—but provides no governance and does not tax.

With these ideas in mind, let $D_{s,c}$ represent each player's payoff from drug retail; payoffs to stationary banditry from above can be notionally distinguished as $E_{s,c}$. The gang's payoff $D_c(\cdot)$ is a function of, among other things, gang governance ($G_c$) and taxation ($t_c$) and of state policing ($P_s$) which the state provides at price $k_p$. $D_s$ represents the direct costs to the state from drug trafficking itself: additional health-care costs, increases in petty crime due to addiction, and any other negative externalities from drug consumption that affect the state.[16] I make two assumptions: 1) $D_c$ and $D_s$ are inversely related: the more the gang earns from drug trafficking, the worse off the state. 2) That relationship is not necessarily zero-sum: for example, states do not "win" the full street value of the drugs they seize from traffickers, nor does an extra dollar of profits for the gang necessarily impose a extra dollar of costs on the state.[17]

A simple formalization of these ideas is to write $D_s = -\alpha D_c$, where $\alpha$ captures the degree of negative externalities for the state created by drug trafficking. I focus on the range $0 \leq \alpha \leq 1$. At $\alpha < 0$, the state benefits from or is totally indifferent to drug trafficking, implausible if prohibition is in effect.[18] $\alpha > 1$ might arise from, say, an epidemic of addiction to a lethal substance like fentanyl, but raises distracting modeling concerns, so I rule it out.[19]

Total utility for each player is now:

$$U_s^D = \underbrace{t_s r(t_s + t_c)Y(G_s + G_c) - k_s G_s}_{E^s} \underbrace{- \alpha D_c - k_p P_s}_{D_s} \tag{20}$$

$$U_c^D = \underbrace{t_c r(t_s + t_c)Y(G_s + G_c) - k_c G_c}_{E^c} + D_c \tag{21}$$

[16] $D_s$ thus is distinct from overall social welfare.

[17] Note that police corruption, which I do not explicitly consider here, is compatible with these assumptions, since bribes would be paid out of $D_c$. Corruption usually involves principal-agent problems within the state, requiring a more complex model with both police and state leaders. A full-blown state-sponsored protection racket (Snyder and Durán Martínez, 2009; Lessing, 2018), however, could be modeled with a unitary state actor, with bribes increasing $D_s$ at the expense of $D_c$.

[18] In the policing iteration of the model to come, if $\alpha = 0$ (or anywhere below a critical value) the state endogenously sets policing to zero—de facto decriminalization. $\alpha < 0$ means that drug trafficking creates positive externalities for the state.

[19] $\alpha > 1$ can lead states to spend more on governance than there is in tax revenue and drug profits combined, raising questions of credit constraints not addressed in this framework.

In general form, I make the following assumptions on $D(\cdot)$:

$$\begin{aligned}
&D_c(\cdot)|_{G_c=0} > 0 \\
&\frac{\partial D_c}{\partial G_c} > 0,\ \frac{\partial^2 D_c}{\partial G_c^2} < 0; \frac{\partial D_s}{\partial G_s} = 0 \\
&\frac{\partial D_c}{\partial t_c} < 0; \frac{\partial^2 D_c}{\partial t_c^2} \leq 0; \frac{\partial D_s}{\partial t_s} = 0 \\
&\frac{\partial D_c}{\partial P_s} < 0;\ \frac{\partial D_s}{\partial P_s} > 0,\ \frac{\partial^2 D_s}{\partial P_s^2} < 0
\end{aligned}$$

Below, I employ a contest success function (CSF) over a total drug "pie", labeled $\phi$, that satisfies these assumptions. First, I derive a general result that will be useful later. Note the gang's first-order conditions for taxation:

$$\frac{\partial U_c}{\partial t_c} = r(t_c + t_s)Y(G_c + G_s) + t_c r'(t_c + t_s)Y(G_c + G_s) + \frac{\partial D_c}{\partial t_c} = 0 \tag{22}$$

$$t_c^* = -\frac{r(t_c^* + t_s)}{r'(t_c^* + t_s)} - \frac{1}{r'(t_c^* + t_s)Y(G_c + G_s)}\frac{\partial D_c}{\partial t_c} \tag{23}$$

Our assumption that $\frac{\partial D_c}{\partial t_c} < 0$ implies $t_c^* < -\frac{r(t_c^*+t_s)}{r'(t_c^*+t_s)}$. That is, if taxation reduces citizen loyalty which reduces drug profits, then the gang taxes at a rate lower, and the state at a rate higher, than $t^D$. Indeed, we now need to account for the fact that $t_c$ is bounded at zero.[20] The gang will not tax at all if:

$$\left.\frac{\partial U_c}{\partial t_c}\right|_{t_c=0} = -\frac{r(t_c + t_s)}{r'(t_c + t_s)} - \frac{1}{r'(t_c + t_s)Y(G_c + G_s)}\frac{\partial D_c}{\partial t_c} \leq 0$$

Since the state's best response to $t_c = 0$ is to tax at the Weberian monopoly rate, $t_s^*|_{t_c=0} = t^M = -\frac{r(t^M)}{r'(t^M)}$, we can write an equilibrium "No gang taxation" condition thus:

$$\left.\frac{\partial D_c}{\partial t_c}\right|_{t_c=0} \leq -r(t^M)Y(G_c + G_s) \qquad \textbf{(Condition NT)}$$

Now consider $C$'s choice of $G_c$:

[20] This was not an issue in the banditry-only model since $-\frac{r(t_c^*+t_s)}{r'(t_c^*+t_s)} > 0$.

$$\frac{\partial U_c}{\partial G_c} = 0 \Rightarrow \begin{cases} Y'(G_c + G_s) = \frac{k_c - \frac{\partial D_c}{\partial G_c}}{t_c r(t_c + t_s)} & \text{if } t_c r(t_c + t_s) > 0 \\ k_c = \frac{\partial D_c}{\partial G_c} & \text{if } t_c r(t_c + t_s) = 0 \end{cases} \tag{24}$$

If **Condition NT** holds, $C$'s only benefit to providing governance comes through increased drug profits. In that case, $C$ will only provide positive governance if:

$$\left.\frac{\partial D_c}{\partial G_c}\right|_{G_c=0} \geq k_c \qquad \text{(Condition } G_c^+\text{)}$$

I focus throughout on regions where **Condition NT** and **Condition** $G_c^+$ hold. This corresponds to gang practice in much of Brazil, and is an important limit case for theory generation. Relaxing **Condition NT** and exploring cases where gangs simultaneously practice drug trafficking and extortion is an important avenue for further analysis.

## 6.1 Functional-Form and Numerical Examples

To solve and analyze the model, I specify functional forms and consider numerical examples. As before, let $r(t) = 1 - t^n; Y(G) = (yG)^{\frac{1}{m}}$, starting with $n = 1, m = 2$. As for $D_c$, I adopt a CSF functional form:

$$D_c = \phi(1 - t_c)\frac{G_c + \eta}{G_c + \eta + P_s}$$

.

Following Lessing (2018), the parameter $\eta > 0$ reflects the gang's baseline "hiding" technology, which under duopoly can be beefed up by providing governance or eroded by taxing.[21] This allows for meaningful comparison with monopoly, where $C$ is constrained to $G_c = t_c = 0$, yielding $D_c^M = \phi\frac{\eta}{\eta + P_s}$. $S$ sets $t_s^M = t^M = \frac{1}{2}$, $G_s^M = G^M \equiv y/(64k_s^2)$, and $P_s^M = \max\left[0, \sqrt{\alpha\phi\eta/k_p} - \eta\right]$, which is positive under the conditions examined below. This yields:

$$U_s^M = \frac{y}{64k_s} - 2\sqrt{\alpha\phi\eta k_p} + \eta k_p. \tag{25}$$

Under duopoly, $C$ chooses $(t_c, G_c)$ and $S$ chooses $(t_s, G_s, P_s)$; outcomes depend on whether play is simultaneous (Nash) or sequential with $S$ moving first (Stackelberg). I first establish a few results common to both, then take them in turn. With these functional forms, we get the following FOC for $G$.

[21] Lessing (2018) uses this framework to compare "hiding" to "fighting" strategies, in which traffickers can threaten police with violence if bribe negotiations fail. Here, I abstract from the issues of bribery and cartel–state conflict, to focus on how governing and taxing civilians affect traffickers' profits.

$$\frac{\partial U_c}{\partial G_c} = 0 \Rightarrow \begin{cases} k_c = \phi \frac{(1-t_c)P_s}{(\eta+G_c+P_s)^2} + \frac{t_c(1-(t_c+t_s))y}{2\sqrt{y(G_c+G_s)}} & \text{if } t_c > 0 \\ k_c = \phi \frac{P_s}{(\eta+G_c+P_s)^2} & \text{if } t_c = 0 \end{cases} \tag{26}$$

(27)

**Condition NT** becomes:

$$-\phi \frac{G_c + \eta}{G_c + \eta + P_s} \leq -r(t_M) Y (G_c + G_s) \tag{28}$$

which can interpreted as a condition on the relative size of potential drug profits to GDP:

$$\frac{\phi}{Y(G_c + G_s)} \geq -r(t_M) \frac{G_c + \eta + P_s}{\eta + G_c} \tag{29}$$

or as a condition on $\phi$, which is useful for analysis and comparison to the other conditions discussed above. Subbing in $n = 1$ and $m = 2$ yields:

$$\phi \geq \frac{G_c + \eta + P_s}{G_c + \eta} \frac{\sqrt{y(G_c + G_s)}}{2} \qquad \textbf{(Condition NT}^s\textbf{)}$$

The following lemma establishes that this is necessary and sufficient for $t_c^* = 0$, for any $(G_c, P_s)$—independent of solution concept.

**Lemma 4.** *For any fixed $G_c \geq 0$ and $P_s \geq 0$, Condition* **Condition NT**$^s$ *is necessary and sufficient for $t_c = 0$ to be the unique global maximizer of $U_c$ over $t_c \in [0, 1)$.*

See proof on page A2. Since Lemma 4 holds for *any* fixed $(G_c, G_s, P_s)$, it immediately rules out joint deviations: for any $(t_c', G_c')$ with $t_c' > 0$, $C$ can do strictly better by switching to $(0, G_c')$, and still better by also optimising $G_c$. Substantively, this tells us that when potential drug profits ($\phi$) are large enough, the gang will not tax at all.

Assume for now that **Condition NT**$^s$ holds and $t_c^* = 0$; then the FOC for $G_c$ (written as an inequality since $G_c$ is bounded at zero) is simply $\phi \frac{(1-t_c^*)P_s}{(\eta+G_c+P_s)^2} \leq k_c$, yielding a best-response function $G_c^*(P_s)$:

$$G_c^*(P_s) = \max \left[ 0, \sqrt{\phi \frac{P_s}{k_c}} - P_s - \eta \right] \tag{30}$$

$G_c^*(P_s)$ is hump-shaped: increasing for $P_s < \phi/(4k_c)$ and decreasing thereafter. This is typical of CSFs: at low $P_s$, policing *crowds in* gang governance; at high $P_s$, policing crowds

it out.

Gang governance is positive iff the marginal return to governance at $G_c = 0$ exceeds its cost $k_c$. From $C$'s FOC at $G_c = 0$, this requires:

$$\phi \frac{P_s}{(\eta + P_s)^2} > k_c. \qquad \textbf{(Condition } G_c^+\textbf{)}$$

Since equilibrium $P_s$ differs between Nash and Stackelberg, this condition must be verified at each equilibrium separately.

As for $G_s^*$, if **Condition NT$^s$** holds, such that $t_s^* = t^M$, the state is willing to provide governance up to $G^M$. If the gang provides less than that, the state will top it up; otherwise, it will play $Gs_* = 0$. Since $G_c^*$ is a function of policing ($P_s$), we can write:

$$G_s^*(P_s) = \max\Big[0,\ G^M - G_c^*(P_s)\Big], \tag{31}$$

Substantively, drug profits large enough to satisfy **Condition NT$^s$** guarantee that duopoly produces weakly greater governance than monopoly. Whether $G_s^* = 0$ depends on whether the equilibrium $P_s$ is high enough that $G_c^*(P_s) \geq G^M$; this is determined separately for each solution concept.

### 6.1.1 Nash equilibrium

In the simultaneous-move game, $S$ and $C$ choose $(t_s, G_s, P_s)$ and $(t_c, G_c)$ without observing one another. Assuming **Condition NT$^s$**, the common results above give $t_c^* = 0$, $t_s^* = t^M$, $G_c^* = G_c^*(P_s)$, and $G_s^* = G_s^*(P_s)$; it remains to find $P_s^{*Nash}$. $S$ maximizes $U_s^D$ over $P_s$ taking $G_c$ as fixed:

$$\alpha\phi\frac{G_c + \eta}{(G_c + \eta + P_s)^2} = k_p \quad \Rightarrow \quad P_s^{*Nash}(G_c) = \max\left[0,\ \sqrt{\frac{\alpha\phi(G_c + \eta)}{k_p}} - G_c - \eta\right] \tag{32}$$

It is obvious from Equation 32 that $\lim_{\alpha\to 0} P_s^{*Nash} = 0$: if the state suffers no disutility from drug profits, it will not police and the drug market is effectively decriminalized. This, I show below, is not true if the state is able to commit to levels of policing (i.e. move first in a Stackelberg EQ). Note too that under **Condition NT**, $G_c^*(P_s = 0) = 0$: under decriminalization, gangs have no incentive to govern. This is true regardless of solution concept.

Assume for a moment that both $G_c^*$ and $P_s^*$ are greater than zero; substituting in, we

derive explicit solutions for each:

$$G_c^{*Nash} = \alpha\phi\frac{k_p}{(\alpha k_c + k_p)^2} - \eta \tag{33}$$

$$P_s^{*Nash} = \alpha^2\phi\frac{k_c}{(\alpha k_c + k_p)^2} \tag{34}$$

Note that $G_c^* > 0$ implies $P_s^* > 0$ so we can focus on **Condition $G_c^+$**. One way to specify it is as a limit on the effectiveness of hiding: $\eta < \alpha\phi\frac{k_p}{(\alpha k_c + k_p)^2}$. If hiding is very effective, it is not worth it to the gang to provide governance. For comparisons' sake, though, it is more useful to rearrange this as a condition on the size of drug profits, $\phi$:

$$\phi > \frac{(\alpha k_c + k_p)^2}{k_p}\frac{\eta}{\alpha} \qquad \textbf{(Condition } \mathbf{G_c^+}\textbf{)}$$

Assuming that **Condition $G_c^+$** holds, which guarantees $P_s^{*Nash} > 0$, we can now substitute back into **Condition NT$^s$** and see under what conditions it holds in equilibrium. This too can be expressed as a cutpoint for $\phi$:

$$-\phi\frac{G_c + \eta}{G_c + \eta + P_s} \leq -\frac{\sqrt{y(G_c + G_s)}}{2} \tag{35}$$

$$\phi \geq \frac{k_p + \alpha k_c}{2k_p}\sqrt{y(\alpha\phi\frac{k_p}{(\alpha k_c + k_p)^2} - \eta)} \tag{36}$$

This cutpoint is concave in $\phi$, so must also be satisfied for sufficiently large $\phi$. Thus for any set of parameter values there is some $\phi$ large enough that Conditions $NT$ and $G_c^+$ both hold. The numerical example below shows that these can be satisfied for reasonable parameter values.

We can further specify $G_s^*(P_s)$ by subbing $P_s^{*Nash}$ into Equation 31:

$$G_s^{*Nash} = \max\left[0, \frac{y}{64k_s^2} - \alpha\phi\frac{k_p}{(\alpha k_c + k_p)^2} - \eta\right]$$

Substituting into $U_s^D$:

$$U_s^{Nash} = \begin{cases} \frac{1}{4}\sqrt{y\,G_c^{Nash}} - \frac{\alpha\phi k_p(\alpha k_c + k_p)}{(\alpha k_c + k_p)^2} & \text{if } G_c^{Nash} \geq G^M \\ \frac{1}{4}\sqrt{y\,G^M} - \frac{\alpha\phi k_p(\alpha k_c + k_p)}{(\alpha k_c + k_p)^2} - k_s(G^M - G_c^{Nash}) & \text{if } G_c^{Nash} < G^M \end{cases} \tag{37}$$

We are now in a position to map areas of the parameter space where the state prefers duopolies to monopolies of violence. I first show that such spaces exist (without resort to unrealistic parameter values), then that changes in parameter values can flip the state's preference.

**Result 1.** *Consider the following numerical example (A), with parameter values:* $\eta = .1; y = 20; k_p = k_s = k_c = 1; \alpha = .15; \phi = 20$. *This yields the following outcomes for the duopoly model:* $G_c^* > 0, t_c^* = 0, G_s^* = 0, t_s^* = t_M^*$. *Moreover,* $U_s^{Nash} > U_s^M$ *and* $G^{Nash} > G^M$.

Figure 4 confirms that $(t_c^* = 0, G_c^{Nash})$ is the global maximum of $U_c$ when $P_s$ is held at $P_s^{Nash}$—no profitable joint deviation in $(t_c, G_c)$ exists.

Thus it is possible to construct an equilibrium in which gangs provide all the local governance without taxing at all, one which the state prefers to a Weberian monopoly. This does not constitute a low-governance trap; rather, more governance is provided under criminal duopoly *even though we have assumed identical costs of governance:* $k_s = k_c$. This is possible precisely because the gang is drawing on resources from a lucrative drug trade to provide governance. In this convoluted if not perverse way, the state extracts net fiscal benefits from illicit drug profits, even as it suffers enough disutility from them to engage in costly policing.

Key here is that the state does not face excessively steep of costs from drug trafficking. If the direct disutility the state suffers from the drug trade increases, through either an increase in $\alpha$ or $\phi$, its preferences can flip:

**Result 2.** *Consider numerical example (B), with all parameter values same as in (A) but with* $\alpha = .20$. *As before,* $G_c^* > 0, t_c^* = 0, G_s^* = 0, t_s^* = t_M^*$, *and* $G^{Nash} > G^M$. *However,* $U_s^M > U_s^{Nash}$.

Figure 5 places points $A$ and $B$ in the parameter space $(\phi, \alpha)$, with coloured contours indicating the value of $U_s^M - U_s^{Nash}$; where this value is positive (in blue), the state prefers monopoly, and where negative (in purple) the state prefers duopoly. Values for key select outcomes are reported in the grids above the plot. An increase in $\alpha$ from .15 to .20 pushes the state from $A$ to $B$, i.e. into a region where it is fiscally better off under monopoly.

We can gain further insight by comparing outcome variables under the two regimes. Policing is lower under duopoly, because it is less effective due to gang governance. Total

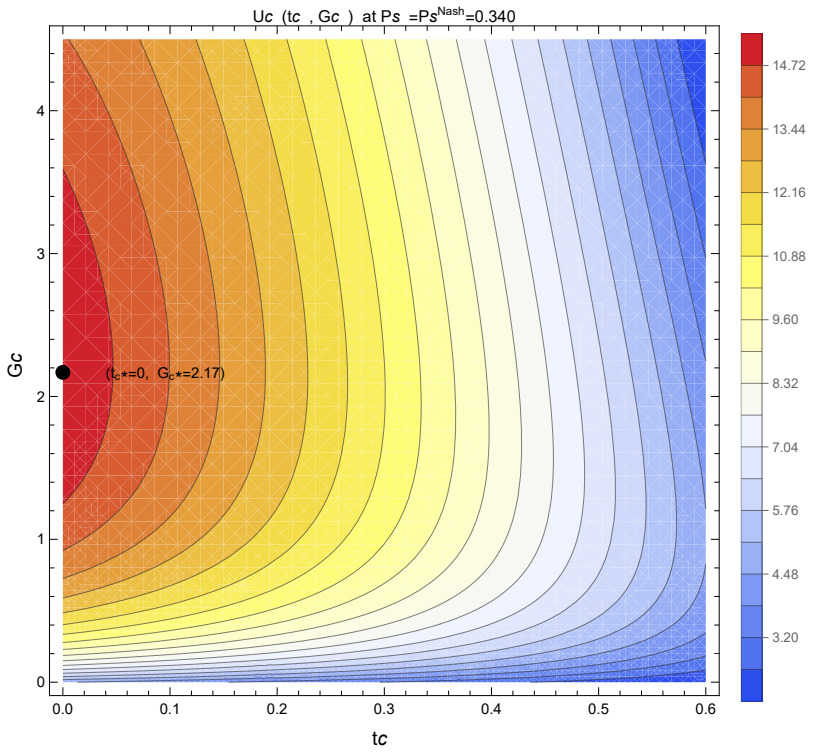



**Figure 4. Gang utility $U_c^{Nash}(t_c, G_c)$ at Nash equilibrium (Example A).** Contour map of $U^c$ with $P_s$ fixed at its Nash value $P_s^* = 0.340$. The black dot marks ($t_c^* = 0$, $G_c^* = 2.17$), the global maximum. All contours decrease in every direction from this point, confirming that $t_c^* = 0$ is the unique global maximizer of $U_c^{Nash}$ for any fixed $(G_c, P_s)$. Parameters: $\eta = 0.1$, $k_p = k_s = k_c = 1$, $y = 100$, $\alpha = 0.15$, $\phi = 20$.

governance ($G$), and hence output ($Y(G)$), and hence the states' tax revenue ($E_s$) are all higher under duopoly. Yet so too is the gang's profit-retention share ("CSF") and total drug profits ($D_c$). By raising the latter's negative impact on $U_s^{Nash}$, an increase in $\alpha$ tips the state's preferences over regime. Moreover, at least over the interval from $A$ to $B$, both $P_s^*$ and (hence) $G_c^*$ are increasing in $\alpha$. At $B$, the state cares more about trafficking, so it polices retail markets more, which leads the gang to govern more (in CSFs, marginal utility to inputs is often increasing in the opponent's input over portions of the parameter space (Skaperdas, 1996)). Indeed, the gang would retain a larger share ("CSF") of $\phi$ at $B$ than $A$ because of this "crowding in" effect. The state also benefits from this increased gang governance through taxation, as reflected in a larger $E_s$, but this is outweighed by increased disutility from drug trafficking ($D_s$), and so the state is now better off under a monopoly.

### 6.1.2 Stackelberg equilibrium: $S$ moves first

A key outcome thus far is that drug profits, though they hurt the state directly, can be channeled into governance that generates fiscal benefits via increased economic growth. However,

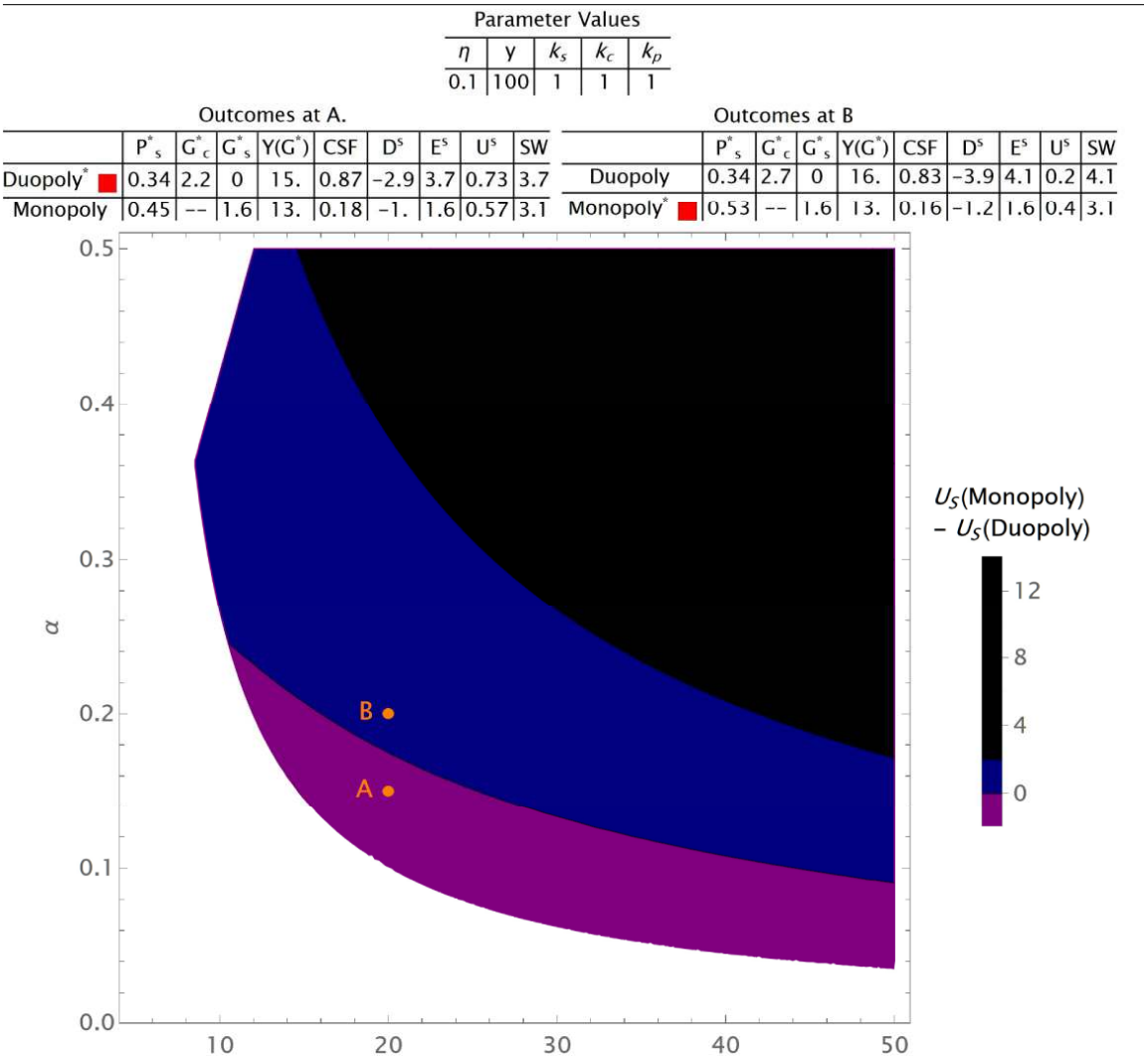



**Figure 5.** State Preferences for Duopolies of Violence in the $(\phi, \alpha)$ Parameter Space: In the colored regions, both **Condition NT$^s$** and **Condition $G_c^+$** hold; contours represent the difference between the state's equilibrium payoff under Monopoly and Duopoly ($U_s^M - U_s^D$)). In blue/black regions, that difference in positive, and the state prefers monopoly. In the purple regions, it prefers duopoly. Increases in the state's sensitivity to drug profits ($\alpha$) can push it to prefer a monopoly, as can increases in the size of the drug market ($\phi$).

under simultaneous-choice, those benefits do not actually affect the state's choice of $P^*$, even though it is precisely that policing that drives the gang to govern. Under Nash, the state invests in policing solely because it reduces drug profits, and thus will only police at all if $\alpha \cdot \phi$ is large enough. That is why $\lim_{\alpha \to 0} P_s^* = 0$, and if the gang is not taxing, $\lim_{\alpha \to 0} G_c^* = 0$.

Yet if, by prohibiting and policing drugs, the state can get drug retailers to govern the periphery for it, it might be willing to do so even if it doesn't care much about drug trafficking per se. Moreover, it may be able to commit itself to high levels of policing, through campaign promises, annual budgets, or public commitments to *mano dura* crackdowns. To capture this intuition, I now model the interaction as a Stackelberg game in which $S$ moves first. I solve by backward induction.

**Stage 2: $C$'s best response.** Given $S$'s committed choices $(t_s, G_s, P_s)$, $C$ maximizes $U_c$ over $(t_c, G_c)$. By Lemma 4, $t_c^* = 0$ whenever **Condition NT$^s$** holds at the prevailing $(G_c, P_s)$; given $t_c^* = 0$, $C$'s governance best response $G_c^*(P_s)$ is as derived in Section 6.1 above. We verify below (Lemma 5) that $S$'s optimum always lies within the NT-valid region, so $C$'s best response takes this simple form throughout $S$'s optimization.

**Stage 1: $S$'s choices.** $S$ simultaneously commits to $(t_s, G_s, P_s)$. The results from Section 6.1 apply directly: $t_s^* = t^M$ and $G_s^*(P_s) = \max[0,\, G^M - G_c^*(P_s)]$. Since $G_c^*(P_s)$ is independent of $G_s$, the governance choice has no strategic dimension. It remains to find $P_s^{*Stack}$. Substituting $t_s^*$ and $G_s^*(P_s)$ into $U_s$, the state maximizes:

$$U_s^{Stack}(P_s) = \begin{cases} \frac{1}{4}\sqrt{y \cdot G_c^*(P_s)} - \alpha\phi\left(1 - \sqrt{\frac{k_c P_s}{\phi}}\right) - k_p P_s & \text{if } G_c^*(P_s) \geq G^M \\ \frac{1}{4}\sqrt{y \cdot G^M} - \alpha\phi\left(1 - \sqrt{\frac{k_c P_s}{\phi}}\right) - k_p P_s - k_s\left(G^M - G_c^*(P_s)\right) & \text{if } G_c^*(P_s) < G^M \end{cases} \tag{38}$$

where identity (30) simplifies the drug-profit term. The objective is continuous at $G_c^*(P_s) = G^M$; I maximize numerically.

Differentiating (38) with respect to $P_s$ and setting equal to zero:

$$\underbrace{[\text{governance benefit}]}_{\text{absent in Nash}} + \underbrace{\alpha\phi \frac{G_c^* + \eta}{(G_c^* + \eta + P_s)^2}}_{\text{drug-harm reduction}} = k_p, \tag{39}$$

where the governance benefit can take one of two forms:

$$\text{governance benefit} = \begin{cases} \underbrace{t^M r(t^M)\, Y'(G_c^*)\, \dfrac{dG_c^*}{dP_s}}_{Y\text{-expansion dividend}} & \text{if } G_c^* \geq G^M \\ \underbrace{k_s \dfrac{dG_c^*}{dP_s}}_{\text{cost-savings dividend}} & \text{if } G_c^* < G^M \end{cases} \tag{40}$$

In both cases, this term is strictly positive and absent from the Nash FOC (32), leading the state to police more under Stackelberg. Only the source of the benefit changes. When $G_c^*(P_s) \geq G^M$ (i.e. the gang provides enough governance that the state fully withdraws), more policing induces more gang governance, expanding output $Y$, increasing $S$'s tax revenues. When $G_c^*(P_s) < G^M$ (i.e. $S$ still supplements gang governance), total governance is pinned at $G^M$, so $Y$ does not improve. However, each dollar of policing induces the gang to provide more than a dollar's worth of governance, saving the state on $G_s$ expenditure.[22]

These dynamics lead to the following result:

**Proposition 3** (Strategic Over-Policing)**.** *Under Conditions* **Condition NT$^s$** *and* **Condition $G_c^+$**:

1. $P_s^{*Stack} > P_s^{*Nash}$ *and* $G_c^{*Stack} > G_c^{*Nash}$*: the Stackelberg state over-polices relative to Nash, inducing higher criminal governance.*
2. $U_s^{Stack} \geq U_s^{Nash}$*: the state is weakly better off with commitment to a policing level.*

See proof on page A3.

As a check, I verify that these optima satisfy **Condition NT$^s$**:

**Lemma 5.** *At the state's Stackelberg optimum $P_s^{*Stack}$, Condition* ***Condition NT$^s$*** *holds: the gang strictly prefers $t_c^* = 0$ to any positive tax. Equivalently, the state never benefits from choosing $P_s$ so large that* ***Condition NT$^s$*** *fails and the gang begins taxing.*

See proof on page A3.

Proposition 3 establishes the mechanism in general; now let us see it at work. Recall that in Examples A above, ($\alpha = 0.15$), Nash duopoly dominates monopoly. In Example B ($\alpha = 0.20$), it does not—but Stackelberg does. Commitment is thus necessary and sufficient for criminal governance to be fiscally attractive at B.

Figure 6 shows $U_s$ across all three regimes as $\alpha$ varies, with Examples A and B marked. Two thresholds emerge:

[22] Formally, $k_s\, dG_c^*/dP_s > k_p$ throughout this regime (numerically verified at $\phi = 20$; $dG_c^*/dP_s \geq 4.5$ at the regime boundary $P_s \approx 0.17$).

**Result 3.** *With $\phi = 20$, $y = 100$, $k_p = k_s = k_c = 1$, there exist thresholds $\alpha^{**} \approx 0.175 < \alpha^* \approx 0.211$ defining three regions:*

1. *$\alpha < \alpha^{**}$: $U_s^{Stack} > U_s^{Nash} > U_s^M > 0$ (Example A). Both duopoly concepts dominate monopoly; commitment raises $U_s$ but does not determine regime preference.*

2. *$\alpha^{**} < \alpha < \alpha^*$: $U_s^{Stack} > U_s^M > U_s^{Nash} > 0$ (Example B). Only the committed Stackelberg state prefers duopoly.* Institutional commitment capacity determines regime preference.

3. *$\alpha > \alpha^*$: $U_s^M > U_s^{Stack} > U_s^{Nash}$. Drug harm outweighs the governance dividend regardless of policing strategy.*

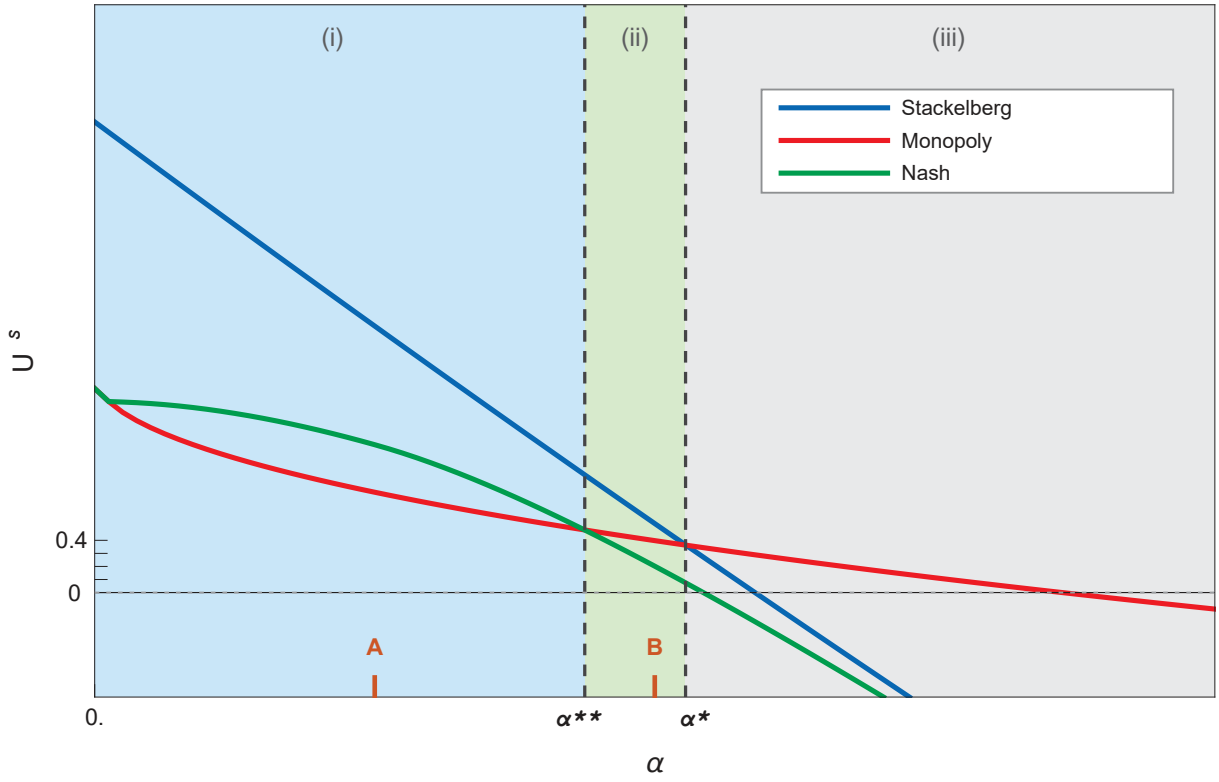



**Figure 6. State Payoff vs. Drug-Harm Sensitivity ($\alpha$).** Stackelberg (blue), Monopoly (red), Nash (green). Vertical dashed lines at $\alpha^{**} \approx 0.175$ and $\alpha^* \approx 0.211$ bound the three regions. Examples A ($\alpha = 0.15$) and B ($\alpha = 0.20$) are marked. Parameters: $\phi = 20$, $y = 100$, $k_p = k_s = k_c = 1$.

*Example A ($\alpha = 0.15$, region (i): $\alpha < \alpha^{**}$).* With $G_c^{*Nash} = 2.17 > G^M = 1.5625$, both equilibria lie in the $Y$-expansion regime ($G_s^* = 0$ under Nash and Stackelberg).

| | $G_c^*$ | $G_s^*$ | $P_s^*$ | $U_s$ | $U_c$ |
|---|---|---|---|---|---|
| Nash | 2.17 | 0 | 0.340 | 0.732 | 15.22 |
| Stackelberg | 3.59 | 0 | 1.191 | 1.278 | 11.53 |
| Monopoly | 0 | 1.563 | 0.448 | 0.567 | 3.65 |

Nash duopoly already dominates monopoly ($U_s^{Nash} = 0.732 > U_s^M = 0.567$): even without commitment, drug-market competition generates enough criminal governance to benefit the state fiscally. Commitment raises $U_s$ a further 75%: the Stackelberg state more than triples policing ($P_s^{*Stack} = 1.191$ vs. $P_s^{*Nash} = 0.340$), inducing 65% more criminal governance ($G_c^{*Stack} = 3.59$ vs. $G_c^{*Nash} = 2.17$).

*Example B ($\alpha = 0.20$, region (ii): $\alpha^{**} < \alpha < \alpha^*$).*

| | $G_c^*$ | $G_s^*$ | $P_s^*$ | $U_s$ | $U_c$ |
|---|---|---|---|---|---|
| Nash | 2.68 | 0 | 0.556 | 0.202 | 13.99 |
| Stackelberg | 3.72 | 0 | 1.326 | 0.528 | 11.13 |
| Monopoly | 0 | 1.563 | 0.532 | 0.398 | 3.16 |

Without commitment, the state prefers monopoly ($U_s^{Nash} = 0.202 < U_s^M = 0.398$): drug-harm sensitivity is high enough that the state would rather eliminate the gang than coexist with it. With commitment, duopoly dominates ($U_s^{Stack} = 0.528 > U_s^M = 0.398$): by credibly committing to heavy policing, the state induces enough criminal governance to more than offset the drug-harm cost, achieving 161% higher utility than under Nash.

A striking limit case: at $\alpha = 0$ (no direct anti-drug motivation whatsoever), the state still runs a drug war under Stackelberg— $P_s^{*Stack} = 0.652$, $G_c^{*Stack} = 2.046$, $U_s^{Stack} = 2.923 > U_s^M = 1.563$. Policing here is purely instrumental: the state fights a drug war it cares nothing about, entirely to induce gangs to govern peripheries for it.

A parallel set of results emerges from varying $\phi$ (the size of the drug market) holding $\alpha = 0.25$ fixed. Figure 7 shows $U^s$ under all three regimes as $\phi$ varies from 4 to 22.

**Result 4** (Goldilocks Drug Market)**.** *For $\alpha = 0.25$, $\eta = 0.1$, $k_p = k_s = k_c = 1$, $y = 100$, there exists a threshold $\phi^* \approx 14.44$ such that:*

$$\phi < \phi^* \Rightarrow U^s_{Stack} > U^M_s \quad \textit{(state prefers Stackelberg duopoly)}$$
$$\phi > \phi^* \Rightarrow U^M_s > U^s_{Stack} \quad \textit{(state prefers monopoly)}$$

*There is no lower threshold: $U^s_{Stack} > U^M_s$ for all $\phi > 0$ (under Condition **Condition NT$^s$**). At $\phi^*$, $U^s > 0$ and Condition **Condition NT$^s$** holds.*

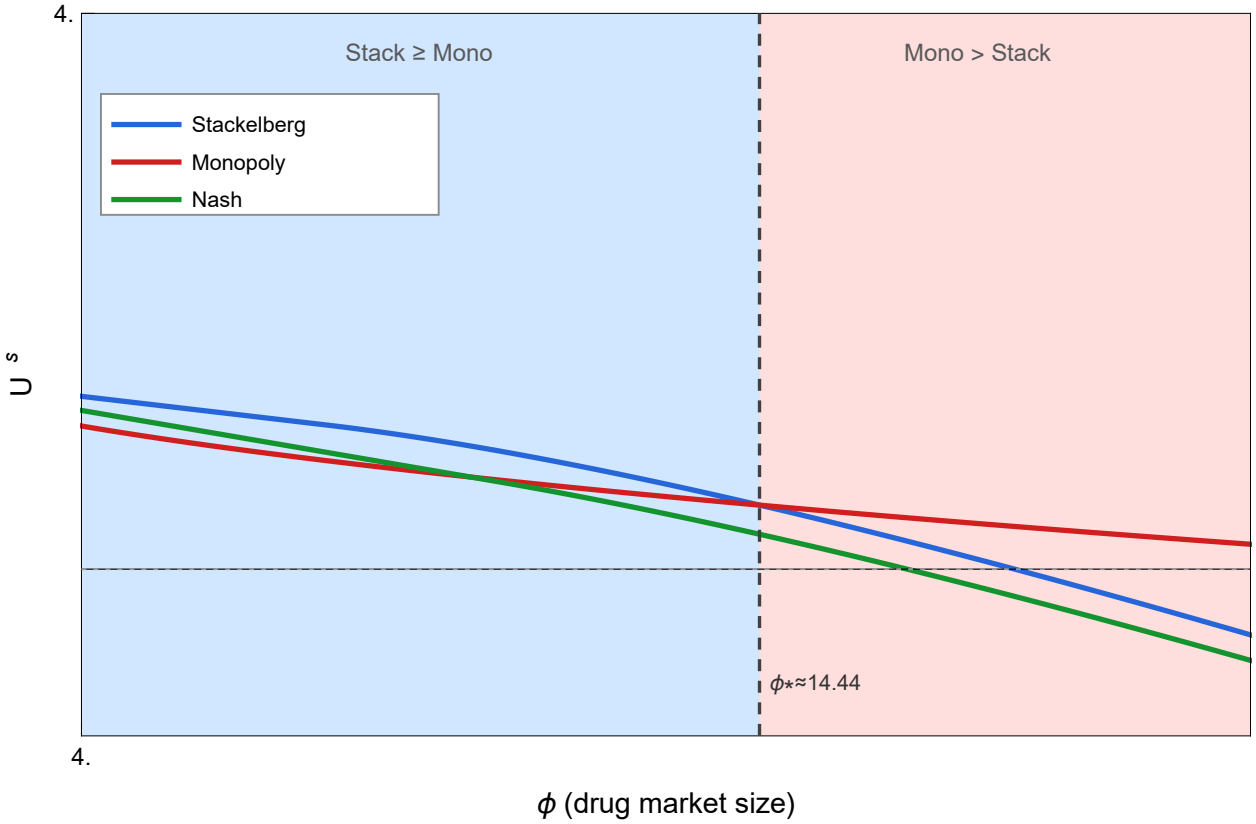



**Figure 7. State Payoff vs. Drug Market Size ($\phi$): The Goldilocks Region.** As $\phi$ increases, $U^s_{Stack}$ initially rises (gang governance and hence tax revenue increase) then falls (drug harm dominates). Stackelberg duopoly is preferred for all $\phi < \phi^* \approx 14.44$ (blue region); monopoly is preferred for $\phi > \phi^*$ (red region). There is no lower threshold: even a small drug market generates enough governance incentive for the state to prefer duopoly under Stackelberg. Parameters: $\alpha = 0.25$, $y = 100$, $k_p = k_s = k_c = 1$.

The intuition is as in the baseline model: the drug market must be large enough that the gang has substantial profits to protect—and hence strong incentives to govern—but not so large that the state's disutility from drug harm overwhelms the governance dividend. This is the model's "Goldilocks" condition for persistent criminal duopoly.

Taken together, these results characterize the full parameter space in which the state has positive fiscal incentives to tolerate and even instrumentalize criminal drug-trafficking organizations as governance providers. The key conditions are: $\alpha$ not too high (drug harm is not existential), $\phi$ not too large (drug profits are not ruinous), and $S$ able to commit to a policing level (the Stackelberg assumption). When all three hold, the state runs a drug war it cares relatively little about—not to reduce trafficking, but to get gangs to govern.

## 6.2 Social Welfare

Earlier, I modeled social welfare thus:

$$W^M = (1 - t^M)r(t^M)Y(G^M) \tag{41}$$

$$W^D = (1 - t^D)r(t^D)Y(G^D) - \xi^D \tag{42}$$

with $\xi^D$ representing the net psychological costs and other externalities of duopoly relative to monopoly. This formulation concerned governance and did not consider residents' disutility from drug trafficking and consumption, but since $D_c(\cdot)$ is weakly higher under duopoly, we can assume it just makes $\xi^D$ larger.

Modeled thus, $\xi^D$ turns out to be decisive for net social welfare, because total governance is always higher under duopoly, while taxes are equal. Under **Condition NT**, $t_c^* = 0$ and $t_s^* = t^M$, while **Condition NT** also guarantees that $G^D \geq G^M$: if $G_c^* < G^M$ then $S$ makes up the difference. This is because, with gang taxes at zero, $S$ gets the full benefits of taxation it would get under monopoly, and hence has the same encompassing interest. Moreover, under **??**, $G^D$ is strictly larger than $G^M$. If, as we did in Section 5.3, we ignore $\xi^D$, then for any region of the parameter space where these conditions all hold, social welfare is strictly higher under duopoly:

$$W^D = (1 - t^M)r(t^M)Y(G^D) > (1 - t^M)r(t^M)Y(G^M) = W^M$$

Thus in Figure 5, all blue areas constitute low-governance traps: the state prefers a monopoly even though less governance is provided than under duopoly. These traps are strictly malign If $\xi^D$ is zero, or smaller than the added welfare benefits of greater total governance provision.

Does orderly duopoly outweigh less orderly monopoly? For slum residents, this is the million-dollar question. Criminal groups can turn their neighborhoods into places where they do not need to lock their doors at night, but the effectiveness of this governance can come at the price of their brutality, lack of accountability, and relative freedom to traffick drugs. Residents would almost certainly prefer full and effective citizenship under the rule of law; but in practice the relevant counterfactual is rather neglect and under-provision by the state.

Of course, many slum residents are also subject to extortion by gangs—one reason to explore relaxing **Condition NT**. To gain some intuition, let $\phi = 0$, so that $\frac{\partial D_c}{\partial t^c} = 0$. Then we revert to the baseline model, with $t_c^* = t_s^* = t^D$. The total tax rate is $2t^D$, which is greater than $t^M$, and hence $G^D < G^M$. Here, with higher taxes and lower governance, residents are strictly worse off under duopoly, even if $\xi^D = 0$. Now let $\phi$ increase; $\frac{\partial D_c}{\partial t^c} < 0$, so $t_c^*$ falls,

reaching zero once $\phi$ satisfies **Condition NT**, beyond which $G^D \geq G^M$. So for at least some of this intermediate range of $\phi$ (still to be fully analyzed), $G^D < G^M$. In this range, malign low-governance traps may be possible: a worst-case scenario in which states prefer duopolies even though residents receive less governance and pay more taxes, making them strictly worse off even prior to the considerations captured by $\xi^D$.

# 7 Discussion and Conclusion

This modeling framework, though simple, provides an intuitive illustration of the basic dynamics behind shared projects of governance: the all-but-undeniable claim that states can benefit from criminal governance means that, under certain circumstances, they might prefer a duopoly of violence to a Weberian monopoly. Moreover, just as the logic of "encompassing interest" leads stationary bandits to make public investments and exercise tax restraint, and the more encompassing interest of democratic government leads it to outperform autocracy, the less encompassing interest of stationary bandits in duopolies of violence tend to produce worse outcomes for citizens than even autocratic monopolies: higher tax rates and lower public investment. Putting these two insights together, the model shows that is possible to have a "malign low-governance trap" in which the state prefers a criminal duopoly even though it results in less total governance than a Weberian monopoly.

This modeling framework, though simple, captures the basic dynamics behind shared projects of governance: states may not be so much "stuck with" duopoly as made better off by it than by Weberian monopoly. This is problematic. Just as the logic of "encompassing interest" leads even autocratic stationary bandits to make public investments and exercise tax restraint, and the more encompassing interest of democracies leads them to outperform autocracy (Olson, 1993), the less encompassing interest of stationary bandits in duopolies of violence tend to produce worse outcomes for citizens: higher tax rates and lower public investment. Putting these two insights together, the model shows that is possible to have a "malign low-governance trap" in which the state prefers a criminal duopoly even though it results in less total governance than a Weberian monopoly.

Yet when drug retailing is taken into account, additional perverse outcomes are possible. The state can achieve quite good outcomes for itself: inducing gangs to provide higher levels of governance than it would under a Weberian monopoly while refraining entirely from taxation. This leaves the state in a position to reap the benefits of order, via tax revenue, while providing little or no public goods at all. The model reveals how drug profits, though they are painful to the state, can indirectly benefit the state by providing resources for (gang) governance, which in turn grow the economic pie which the state is left alone to tax.

This is a potentially critical—and largely unexplored—reason why duopolies of violence may persist. By prohibiting and repressing the sale of drugs with strong and inelastic consumer demand, states both create highly profitable markets (Becker et al., 2006; Miron, 2003) and make those profits inaccessible for direct state taxation.[23] This stunning, uncharacteristic forgoing of a rich basis of revenue extraction is mitigated to some extent by back-channel forms of state appropriation. Most common, and problematic, is regularized low-level bribery: police demand a portion of retail drug profits in exchange for non-enforcement. For traffickers, this functions as a tax (Shleifer and Vishny, 1993), yet corruption only benefits the central state fiscally if, anticipating and effectively sanctioning such corruption, police salaries are lowered accordingly. Some states experiment with an alternative, though no less problematic, mechanism to incorporate drug profits into state-accessible product: asset forfeiture laws. U.S. police agencies, for example, capture billions of dollars per year in drug profits (generally by auctioning off the seized property of accused traffickers) for their own budgets, at the cost of increasing dependency and severe moral hazard (Andreas, 2013; Worrall, 2001).

Criminal governance funded through drug retailing provides a more indirect, but cleaner, channel. Criminal groups use drug profits to fund governance activities that keep sprawling peripheries orderly and functional parts of larger urban economies. The state reaps fiscal benefits from this, not only by saving on the direct costs of providing governance, but because criminal groups often provide *more* governance than states would in their absence, boosting state-accessible, legal economic production. In this roundabout way, and despite the many costs that drug consumption and trafficking create, governing gangs' drug profits become partially state-appropriable, no corrupting bribery or asset forfeiture required. Moreover, the more the state polices drug retailing, the more profitable the trade becomes (Castillo and Kronick, 2020), and the more incentives and resources gangs have to provide governance. Perversely, the selfsame policing allows leaders to adopt "tough on crime" stances that make these crime–state shared projects of governance politically sustainable across administrations.

[23] This fact is perennially invoked by drug-legalization advocates, to middling success.

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# Appendix 1 Proofs

**Lemma 1.** *In equilibrium, players' optimal tax rates are identical:*

$$t_s^* = t_c^* \equiv t^D = -\frac{r(2t^D)}{r'(2t^D)}$$

.

*Proof of Lemma 1.* From 5, the FOC for player $i$ is

$$\frac{\partial V_i}{\partial t_i} = r(t_i + t_j)Y(G) + t_i \frac{\partial r(t_i+t_j)}{\partial t_i} Y(G) = 0 \tag{43}$$

$$= r(t_i^* + t_j^*) + t_i \frac{\partial r(t_i+t_j)}{\partial t_i} = 0 \tag{44}$$

We can rewrite $\frac{\partial r(t_i+t_j)}{\partial t_i}$ as $\frac{\partial r(t_i+t_j)}{\partial t}\frac{\partial t}{\partial t_i} = \frac{\partial r(t_i+t_j)}{\partial t} = r'(t)$. This yields:

$$t_i^*(t_j) = -\frac{r(t_i^* + t_j)}{r'(t_i^* + t_j)}$$

By a similar derivation, $t_j^*(t_i) = -\frac{r(t_i+t_j^*)}{r'(t_i+t_j^*)}$

So in Nash Equilibrium:

$$t_i^* = -\frac{r(t_i^* + t_j^*)}{r'(t_i^* + t_j^*)} = t_j^* \equiv t^{D*} = -\frac{r(2t^{D*})}{r'(2t^{D*})}$$

□

**Proposition 1.** *The total tax rate under duopoly exceeds the revenue-maximizing tax rate under Weberian monopoly, though each bandit's tax rate is lower. That is,* $t_i^* + t_j^* = 2t^D > t^M$, *but* $t_i^* = t_j^* = t^D < t^M$.

*Proof of Proposition 1.* Assume toward contradiction that $t_i^* + t_j^* \leq t^{M*}$. This implies that $t_i^*$ (and $t_j^*$) $\leq \frac{t^{M*}}{2}$, so consider $i$'s objective function at $t_i = t_j = \frac{t^{M*}}{2}$. If $t_i^* \leq \frac{t^{M*}}{2}$ then the derivative of this function with respect to $t_i$ must be weakly negative. Substituting into the

FOC of Equation 44:

$$\left.\frac{\partial P_i}{\partial t_i}\right|_{t_i=t_j=\frac{t^{M*}}{2}} = \left(r(t_i+t_j)+t_i r'(t_i+t_j)\right) Y(G) \leq 0 \tag{45}$$

$$= r(\hat{t^*})+t_i r'(\hat{t^*}) \leq 0 \tag{46}$$

$$= r(\hat{t^*})+\tfrac{\hat{t^*}}{2} r'(\hat{t^*}) \tag{47}$$

From the FOC in the baseline model, Equation 2, we know that $r(\hat{t^*})+\hat{t^*}r'(\hat{t^*})=0$, so we can subtract these terms from the inequality above, yielding:

$$\left.\frac{\partial P_i}{\partial t_i}\right|_{t_i=t_j=\frac{\hat{t^*}}{2}} = r(\hat{t^*})-r(\hat{t^*})+\tfrac{\hat{t^*}}{2} r'(\hat{t^*})-\hat{t^*}r'(\hat{t^*}) \leq 0 \tag{48}$$

$$= -\tfrac{\hat{t^*}}{2} r'(\hat{t^*}) \leq 0 \tag{49}$$

By assumption, $r'<0$, so $-\frac{\hat{t^*}}{2}r'(\hat{t^*})>0$. $\Rightarrow\Leftarrow$. In words, for values of $t_i$ and $t_j \leq \frac{t^{M*}}{2}$, either player can increase their utility by increasing their tax rate. □

**Lemma 2.** *$\frac{k_c}{k_s} > \omega \Rightarrow W^D < W^M$, and $\frac{k_c}{k_s} < \omega \Rightarrow W^D > W^M$*

*Proof of Lemma 2.* For $k_c \geq k_s$ social welfare is higher under monopoly. So $\frac{k_c}{k_s}=\omega$ implies $k_c < k_s$ and $C$ provides all the governance. Thus from $\omega$ any increase (decrease) in $k_c$ will lower (raise) $G^D$ and hence lower (raise) $W^D$, without affecting $W^M$. Conversely, a decrease (increase) in $k_s$ will raise (lower) $W^M$ without affecting $W^D$ (since $k_c \leq k_g$). □

**Lemma 4.** *For any fixed $G_c \geq 0$ and $P_s \geq 0$, Condition* **Condition NT$^s$** *is necessary and sufficient for $t_c = 0$ to be the unique global maximizer of $U_c$ over $t_c \in [0,1)$.*

*Proof of Lemma 4.* With $r(t)=1-t$ and $Y(G)=\sqrt{yG}$, $U_c$ as a function of $t_c$ alone (holding $G_c$, $G_s$, $P_s$ fixed) is:

$$U_c(t_c) = t_c(1-t_c-t^M)\sqrt{yG_c} + \phi(1-t_c)\frac{G_c+\eta}{G_c+\eta+P_s} - k_c G_c. \tag{50}$$

The first term is a downward-opening quadratic; the second is linear and decreasing. Their sum is strictly concave: $\partial^2 U_c/\partial t_c^2 = -2\sqrt{yG_c} < 0$. A strictly concave function has its unique maximum either in the interior or at a boundary. The FOC at $t_c = 0$ is:

$$\left.\frac{\partial U_c}{\partial t_c}\right|_{t_c=0} = (1-t^M)\sqrt{yG_c} - \phi\frac{G_c+\eta}{G_c+\eta+P_s}. \tag{51}$$

Condition **Condition NT$^s$** states precisely that this is $\leq 0$: the marginal cost of taxation weakly exceeds its marginal governance revenue at $t_c = 0$. Since $U_c$ is strictly concave and non-increasing at $t_c = 0$, it is decreasing on $[0, 1)$, so $t_c = 0$ is the unique global maximizer. □ □

**Proposition 3** (Strategic Over-Policing)**.** *Under Conditions* **Condition NT$^s$** *and* **Condition G$_c^+$***:*

1. $P_s^{*Stack} > P_s^{*Nash}$ *and* $G_c^{*Stack} > G_c^{*Nash}$*: the Stackelberg state over-polices relative to Nash, inducing higher criminal governance.*
2. $U_s^{Stack} \geq U_s^{Nash}$*: the state is weakly better off with commitment to a policing level.*

*Proof of Proposition 3. Part (i).* At any $P_s$ in the crowding-in region, the Stackelberg FOC (39) includes a strictly positive governance-benefit term (in either regime of (40)) that is absent from the Nash FOC (32). Hence $S$'s marginal benefit of policing is strictly higher under Stackelberg at every such $P_s$, so $P_s^{*Stack} > P_s^{*Nash}$. Since $G_c^*(P_s)$ is increasing in $P_s$ in this region, $G_c^{*Stack} > G_c^{*Nash}$ follows.

*Part (ii): revealed preference.* In the Stackelberg game, $S$ could always choose $P_s = P_s^{*Nash}$. At $P_s^{*Nash} = 0.340$ (Example A, $\alpha = 0.15$, $\phi = 20$), Condition **Condition NT$^s$** holds ($\text{NT}_{\text{LHS}} = 17.39 > \text{NT}_{\text{RHS}} = 7.36$), so $C$'s best response is $t_c^* = 0$, $G_c^* = G_c^{*Nash}$—exactly replicating the Nash outcome and delivering $U_s^{Nash}$. Since $S$ instead chooses $P_s^{*Stack} \neq P_s^{*Nash}$, it must be that $U_s^{Stack} \geq U_s^{Nash}$. This argument holds for all $\alpha$ in regions (i) and (ii) of Result 3, where Condition **Condition NT$^s$** is verified to hold at Nash. □ □

**Lemma 5.** *At the state's Stackelberg optimum $P_s^{*Stack}$, Condition* ***Condition NT$^s$*** *holds: the gang strictly prefers $t_c^* = 0$ to any positive tax. Equivalently, the state never benefits from choosing $P_s$ so large that* ***Condition NT$^s$*** *fails and the gang begins taxing.*

*Proof of Lemma 5.* Condition **Condition NT$^s$** (no-taxation) requires

$$\frac{\phi(G_c + \eta)}{G_c + \eta + P_s} \;\geq\; r(t^M)\, Y(G_c),$$

where $G_c = G_c^*(P_s)$ is the gang's best response. With $\phi = 20$ and the functional forms of Section 6.1, this condition holds for all $P_s \leq \bar{P}_s \approx 4.04$ and fails for $P_s > \bar{P}_s$.

The state's Stackelberg optima lie far below this boundary: $P_s^{*Stack} = 1.19$ (Example A) and 1.33 (Example B), with NT$^s$ satisfied by wide margins (LHS − RHS ≈ 5.6 and 5.2, respectively).

To confirm the state would not benefit from entering the NT-failing region ($P_s > \bar{P}_s$), note that for $P_s$ near $\bar{P}_s \approx 4.04$ the state's payoff is already negative—approximately $-0.19$ at $\alpha = 0.15$ and $-0.74$ at $\alpha = 0.20$—far below the Stackelberg values of 1.28 and 0.53. Intuitively, inducing the gang to tax requires driving up $P_s$ to a level that destroys enough of the gang's drug revenue to make taxing attractive; but at those policing levels the state's own drug-harm savings and governance dividend are overwhelmed by the policing cost $k_p P_s$. Hence the state's Stackelberg optimum always lies in the NT-valid region, and $t_c^* = 0$ obtains in equilibrium. □

# Appendix 2 CES Model, Two Bandits, No Drug Market

I compare a monopoly bandit/state who can control two components of governance $G_s$ and $G_c$ (with complementarities or substitutive effects on each other) at costs $k_s(G_s + G_c)$ vs two bandits which each control one component, where $s$ supplies $G_s$ at cost $k_s G_s$, and $c$ supplies $G_c$ at cost $k_c G_c$, presumably $k_c < k_s$. I assume that the monopolist still has two components of governance to give the cleanest comparison—the production technology of government does not change, simply decision rights ($s$ no longer gets to pick their favorite $G_c$) and a cost variable (but now this $G_c$ is chosen at cost $k_c$). Production will be $Y(G_s, G_c) = 2^{-\frac{\nu}{\mu}}(G_s^\mu + G_c^\mu)^{\frac{\nu}{\mu}}$, with $\mu < 1$ and $\nu < 1$ to guarantee an interior solution. The partial derivative with respect to

$$\frac{\partial Y}{\partial G_i} = 2^{-\frac{\nu}{\mu}} \frac{\nu}{\mu} (G_s^\mu + G_c^\mu)^{\frac{\nu-\mu}{\mu}} \left[\mu G_i^{\mu-1}\right]$$

The monopoly tax rate is still $t^M = -\frac{r(t^M)}{r'(t^M)}$. Thus, the monopolist solves

$$\left(t^M r\left(t^M\right) \frac{\partial Y}{\partial G_s} = k_s\right) \wedge \left(t^M r\left(t^M\right) \frac{\partial Y}{\partial G_c} = k_c\right)$$
$$\implies \frac{k_s}{k_c} = \left(\frac{G_c}{G_s}\right)^{1-\mu}$$

This allows us to turn the governance decision into a one variable problem

$$G_c^*(G_s) = G_s \left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}}$$

Indeed, one can check as $\mu \to 1$, $k_s > k_c$ implies $G_c/G_s \to \infty$ or $G_s \to 0$ since $G_c$ is going to be bounded: they become perfect substitutes, so you should only use the lower cost dimension. As $\mu \to -\infty$, we get $G_c = G_s$ or the perfect complements production function.

Our monopolist objective can be formulated as

$$\begin{aligned}
&\max_{G_s}\left\{2^{-\frac{\nu}{\mu}}t^M r\left(t^M\right)(G_s^\mu + G_c^*(G_s)^\mu)^{\frac{\nu}{\mu}} - k_s G_s - k_c G_c^*(G_s)\right\} \\
&= \max_{G_s}\left\{2^{-\frac{\nu}{\mu}}t^M r\left(t^M\right)\left[G_s^\mu\left(1+\left(\frac{k_s}{k_c}\right)^{\frac{\mu}{1-\mu}}\right)\right]^{\frac{\nu}{\mu}} - \left(k_s + k_c\left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}}\right)G_s\right\}
\end{aligned}$$

Taking the first-order condition

$$\begin{aligned}
&2^{-\frac{\nu}{\mu}}t^M r\left(t^M\right)\left(1+\left(\frac{k_s}{k_c}\right)^{\frac{\mu}{1-\mu}}\right)^{\frac{\nu}{\mu}}\nu G_s^{\nu-1} = \left(k_s + k_c\left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}}\right) \\
\iff &G_s = \left[\frac{2^{-\frac{\nu}{\mu}}t^M r\left(t^M\right)\left(1+\left(\frac{k_s}{k_c}\right)^{\frac{\mu}{1-\mu}}\right)^{\frac{\nu}{\mu}}\nu}{\left(k_s + k_c\left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}}\right)}\right]^{\frac{1}{1-\nu}} \\
\implies &G^M \equiv G_s + G_c = \left[1+\left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}}\right]\left[\frac{2^{-\frac{\nu}{\mu}}t^M r\left(t^M\right)\left(1+\left(\frac{k_s}{k_c}\right)^{\frac{\mu}{1-\mu}}\right)^{\frac{\nu}{\mu}}\nu}{\left(k_s + k_c\left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}}\right)}\right]^{\frac{1}{1-\nu}}
\end{aligned}$$

To make this more readable, let

$$K_\mu \equiv \left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}}$$

and thus

$$G^M = [1+K_\mu]\left[\frac{2^{-\frac{\nu}{\mu}}t^M r\left(t^M\right)(1+(K_\mu)^\mu)^{\frac{\nu}{\mu}}\nu}{k_s + k_c K_\mu}\right]^{\frac{1}{1-\nu}}$$

where $k_c < k_s$ implies

$$\lim_{\mu\to 1}[1+K_\mu]\left[\frac{2^{-\frac{\nu}{\mu}}t^M r\left(t^M\right)(1+(K_\mu)^\mu)^{\frac{\nu}{\mu}}\nu}{k_s+k_cK_\mu}\right]^{\frac{1}{1-\nu}} = \left[\frac{t^M r\left(t^M\right)\nu}{2^\nu k_c}\right]^{\frac{1}{1-\nu}}$$

$$\lim_{\mu\to -\infty}[1+K_\mu]\left[2^{-\frac{\nu}{\mu}}\frac{t^M r\left(t^M\right)(1+(K_\mu)^\mu)^{\frac{\nu}{\mu}}\nu}{k_s+k_cK_\mu}\right]^{\frac{1}{1-\nu}} = 2\left[\frac{t^M r\left(t^M\right)\nu}{k_s+k_c}\right]^{\frac{1}{1-\nu}}$$

$$\lim_{\mu\to 0}[1+K_\mu]\left[2^{-\frac{\nu}{\mu}}\frac{t^M r\left(t^M\right)(1+(K_\mu)^\mu)^{\frac{\nu}{\mu}}\nu}{k_s+k_cK_\mu}\right]^{\frac{1}{1-\nu}} = \left[1+\frac{k_s}{k_c}\right]\left[\frac{t^M r\left(t^M\right)\nu}{2k_s}\right]^{\frac{1}{1-\nu}}$$

Notice as $k_c \to k_s$ all of these become equal, since $2\left(\frac{1}{2}\right)^{\frac{1}{1-\nu}} = \left(\frac{1}{2}\right)^{\frac{\nu}{1-\nu}}$. In fact, for all $\mu$, $k_c = k_s$ implies

$$G^M = \left[\frac{t^M r\left(t^M\right)\nu}{2^\nu k_s}\right]^{\frac{1}{1-\nu}}$$

which might be a good benchmark if the monopolist cannot replicate $G_c$ at cost $k_c$, but instead at cost $k_s$.

Now, we try to solve the duopoly case. In this case, we still have the same tax rates as before $t^D = -\frac{r\left(2t^D\right)}{r(2t^D)}$. We still apply

$$\frac{\partial Y}{\partial G_i} = 2^{-\frac{\nu}{\mu}}\frac{\nu}{\mu}(G_s^\mu + G_c^\mu)^{\frac{\nu-\mu}{\mu}}\left[\mu G_i^{\mu-1}\right]$$

and

$$\left(t^D r\left(2t^D\right)\frac{\partial Y}{\partial G_s} = k_s\right) \wedge \left(t^D r\left(2t^D\right)\frac{\partial Y}{\partial G_c} = k_c\right)$$
$$\implies \frac{k_s}{k_c} = \left(\frac{G_c}{G_s}\right)^{1-\mu}$$

but now we cannot treat one $G$ as a reaction function to the other. That is, again defining

$$G_c^*(G_s) = G_s\left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}} \equiv K_\mu G_s$$

we need to solve the fixed point of

$$G_s^* : t^D r\Big(2t^D\Big)\frac{\partial Y}{\partial G_s}(G_s^*, G_c^*(G_s^*)) = k_s$$

i.e. $(G_s^*, G_c^*)$ need to be optimal in the perspective where $s$ understands that deviations from $G_s^*$ do not lead to reactions in $G_c$ (hence the lack of all the $\frac{\partial G_s}{\partial G_c}$ terms).

$$\begin{aligned}
&2^{-\frac{\nu}{\mu}}\nu[1+(K_\mu)^\mu]^{\frac{\nu-\mu}{\mu}}\Big((G_s^*)^{\nu-\mu}\Big)\Big[(G_s^*)^{\mu-1}\Big] = \frac{k_s}{t^D r(2t^D)} \\
\implies G_s^D &= \left[\frac{2^{-\frac{\nu}{\mu}}t^D r\Big(2t^D\Big)[1+(K_\mu)^\mu]^{\frac{\nu-\mu}{\mu}}}{k_s}\right]^{\frac{1}{1-\nu}} \\
\implies G_c^D &= K_\mu G_s \\
\implies G^D &= [1+K_\mu]\left[\frac{2^{-\frac{\nu}{\mu}}t^D r\Big(2t^D\Big)[1+(K_\mu)^\mu]^{\frac{\nu-\mu}{\mu}}}{k_s}\right]^{\frac{1}{1-\nu}}
\end{aligned}$$

under the assumption that $(k_s, k_c)$ are equivalent in the monopoly and duopoly case, then

$$\begin{aligned}
\frac{G^M}{G^D} &= \left[\frac{t^M r\Big(t^M\Big)[1+(K_\mu)^\mu]k_s}{t^D r(2t^D)[k_s+k_c K_\mu]}\right]^{\frac{1}{1-\nu}} \\
&= \left[\frac{t^M r\Big(t^M\Big)}{t^D r(2t^D)}\right]^{\frac{1}{1-\nu}} > 1 \iff ((K_\mu)^\mu k_s = k_c K_\mu)
\end{aligned}$$

which seems like the exact same distortion as before, and is independent of the degree of complements/substitutes. If you assume that $\kappa k_s^M = k_s^D$ and $\kappa k_c^M = k_c^D$, then the distortion $\delta$ is:

$$\frac{G^M}{G^D} = \left[\kappa\frac{t^M r\Big(t^M\Big)}{t^D r(2t^D)}\right]^{\frac{1}{1-\nu}} \equiv \delta^{-1}$$

and thus

$$G^M > G^D \iff \kappa > \frac{t^D r\big(2t^D\big)}{t^M r(t^M)}.$$

Given a total amount of governance $G$, the total cost is

$$\frac{G}{1+K_\mu}k_s + \frac{GK_\mu}{1+K_\mu}k_c = G\left[\frac{1}{1+K_\mu}k_s + \frac{K_\mu}{1+K_\mu}k_c\right].$$

Since production is homogenous of degree $\nu$, or $Y(\delta G) = \delta^\nu Y(G)$ (with the slight abuse of notation of $Y(G)$ meaning total production given a total inputs $G \geq 0$ assuming efficient allocation), we have that the state prefers the duopoly if

$$\begin{aligned}
&\delta^\nu Y\big(G^M\big)t^D r\big(2t^D\big) - \frac{\delta\kappa G^M k_s^M}{1+K_\mu} > Y\big(G^M\big)t^M r\big(t^M\big) - G^M\left[\frac{1}{1+K_\mu}k_s^M + \frac{K_\mu}{1+K_\mu}k_c^M\right] \\
\iff & G^M\left[\frac{k_s^M(1-\delta\kappa) + K_\mu k_c^M}{1+K_\mu}\right] > Y\big(G^M\big)\Big[t^M r\big(t^M\big) - \delta^\nu t^D r\big(2t^D\big)\Big] \\
\iff & G^{M1-\nu} > \frac{(1+K_\mu)\Big(Y(1)\Big[t^M r\big(t^M\big) - \delta^\nu t^D r\big(2t^D\big)\Big]\Big)}{k_s^M(1-\delta\kappa) + K_\mu k_c^M} \\
\iff & G^M > \left(\frac{(1+K_\mu)\Big(Y(1)\Big[t^M r\big(t^M\big) - \delta^\nu t^D r\big(2t^D\big)\Big]\Big)}{k_s^M(1-\delta\kappa) + K_\mu k_c^M}\right)^{\frac{1}{1-\nu}} \\
\iff & [1+K_\mu]^{1-\nu}\left[\frac{2^{-\frac{\nu}{\mu}}t^M r\big(t^M\big)(1+(K_\mu)^\mu)^{\frac{\nu}{\mu}}\nu}{k_s^M + k_c^M K_\mu}\right] > \frac{(1+K_\mu)\Big(Y(1)\Big[t^M r\big(t^M\big) - \delta^\nu t^D r\big(2t^D\big)\Big]\Big)}{k_s^M(1-\delta\kappa) + K_\mu k_c^M}
\end{aligned}$$

where, to remind you of the shorthands

$$\begin{aligned}
K_\mu &\equiv \left(\frac{k_s}{k_c}\right)^{\frac{1}{1-\mu}} \\
\delta &\equiv \left[\frac{t^D r\big(2t^D\big)}{\kappa t^M r(t^M)}\right]^{\frac{1}{1-\nu}}
\end{aligned}$$

and $\kappa < 1$ is an exogenous parameter that captures the cost efficiency of having the gangs help in governance. In fact, we could write

$$\frac{k_s^M}{k_c^M} = (K_\mu)^{1-\mu}$$

and then the inequality for duopoly to be preferable to monopoly becomes

$$\begin{aligned}
&[1+K_\mu]^{1-\nu}\left[\frac{2^{-\frac{\nu}{\mu}}t^M r\Big(t^M\Big)(1+(K_\mu)^\mu)^{\frac{\nu}{\mu}}\nu}{(K_\mu)^{1-\mu}+K_\mu}\right] > \frac{(1+K_\mu)\Big(Y(1)\Big[t^M r\Big(t^M\Big)-\delta^\nu t^D r\Big(2t^D\Big)\Big]\Big)}{(K_\mu)^{1-\mu}(1-\delta\kappa)+K_\mu}\\
\iff &\frac{2^{-\frac{\nu}{\mu}}t^M r\Big(t^M\Big)\nu}{Y(1)[t^M r(t^M)-\delta^\nu t^D r(2t^D)]} > \left(\frac{1+K_\mu}{(1+(K_\mu)^\mu)^{\frac{1}{\mu}}}\right)^\nu \frac{1+(K_\mu)^\mu}{(1-\delta\kappa)+(K_\mu)^\mu}
\end{aligned}$$

where the only things that depend on $\mu$ are on the right-hand side. Maybe I should move $Y(1)$ to the other side, since it may be effect by $\mu$,

$$\begin{aligned}
Y(1) &= 2^{-\frac{\nu}{\mu}}\left[\left(\frac{1}{1+K_\mu}\right)^\mu+\left(\frac{K_\mu}{1+K_\mu}\right)^\mu\right]^{\frac{\nu}{\mu}}\\
&= 2^{-\frac{\nu}{\mu}}\frac{(1+(K_\mu)^\mu)^{\frac{\nu}{\mu}}}{(1+K_\mu)^\nu}
\end{aligned}$$

that actually cancels many terms. The state prefer duopoly if and only if

$$\frac{t^M r\Big(t^M\Big)\nu}{[t^M r(t^M)-\delta^\nu t^D r(2t^D)]} > \frac{1+(K_\mu)^\mu}{(1-\delta\kappa)+(K_\mu)^\mu}$$

only the RHS depends on $\mu$ and is strictly decreasing in $\mu$ by

$$\delta\kappa = \left[\frac{t^D r\Big(2t^D\Big)}{t^M r(t^M)}\right]^{\frac{1}{1-\nu}}\kappa^{\frac{\nu}{1-\nu}} < 1.$$

Note $(K_\mu)^\mu$ is strictly increasing in $\mu\in(-\infty,1)$, and $\lim_{\mu\to-\infty}(K_\mu)^\mu=0$, $\lim_{\mu\to1}(K_\mu)^\mu=\infty$. Thus highest $\mu$ is the most duopoly favoring $\mu$. However, duopoly is only preferred by the masses if

$$\begin{aligned}
&\Big(1-2t^D\Big)r\Big(2t^D\Big)\delta^\nu Y\Big(G^M\Big) > \Big(1-t^M\Big)r\Big(t^M\Big)Y\Big(G^M\Big)\\
\iff &\Big(1-2t^D\Big)r\Big(2t^D\Big)\delta^\nu > \Big(1-t^M\Big)r\Big(t^M\Big)
\end{aligned}$$

which in no way depends on $\mu$.