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"Decentralization in Autocraties"

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Decentralization in Autocraties *

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Abstract

In a model featuring two regions—one affluent and the other impoverished— the allocation of public spending is examined under an initially centralized and autocratic political process. In a stable autocracy, the decision to implement decentralization reforms hinges on a tradeoff: while centralization enables the autocrat to extract higher rents, it also results in reduced productivity in the poor region. The autocrat opts for decentralization when the negative impact on productivity outweighs the benefits of rent extraction. Moreover, under the pressure of democratic movements and growing instability, an authoritarian regime may also pursue decentralization reforms to preserve its wealth from the decisions of the poor median voter.

JEL Classification: D02, D72, D74, O57, P48

Keywords: Autocracy, decentralization, democratization

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1 Introduction

From the 1980s to the mid-2000s, many countries with a history of highly centralized governments took steps towards decentralization (Grindle, 2007). Decentralization has been a major component of the public-sector reforms pushed by international financial institutions such as the World Bank (1998) to support the democratization process that swept the world after the fall of the Berlin Wall in 1989.[1] The OCDE (2019) describes decentralisation as measures that transfer a range of powers, responsibilities and resources from central government to subnational governments, defined as legal entities *elected by universal suffrage* and having some degree of autonomy. However, democracy is neither a necessary nor a sufficient condition for decentralization, as illustrated by the fact that major episodes of decentralization (e.g. in Chile, Argentina, Pakistan, China, Ethiopia) have been implemented by autocratic regimes. In this article, we explore the driving forces that can lead an authoritarian central government to relinquish fiscal power to subnational governments, namely tax collection and spending decisions for local public goods.

We develop a model to study the effects of fiscal decentralization in an autocratic country with two regions, one rich and one poor, where people have no mobility (i.e., contrary to a democratic context where people can vote with their feet). The more populated region is the poor region. In both region there is a private sector that is taxed. The autocrat diverts part of the taxes collected for his own private use, while the rest is used to finance a public good, the availability of which at local level depends on a combination of national and local investments. An interesting and original feature of the model is that the public good available locally is an input into the production process, so that the productivity and wealth of each region is endogenous. To our knowledge, this is new in the theoretical literature on decentralization reforms, as most articles focus on the allocation of

[1] According to the Economist Intelligence Unit, more than half (53.7%) of the world's population lived in a democracy of some sort in 2020, yet only resided in 8.4% full democracy, while more than a third were under authoritarian rules. For the Economist Intelligence Unit's measure of democracy see the Democracy Index 2021, report available at https://www.economist.com/graphic-detail/2021/02/02/global-democracy-has-a-very-bad-year.

fiscal resources to local public goods under the assumption that tax revenues or output are fixed. By endogenizing production and tax revenues, we obtain several interesting results.

The model starts from a situation where an autocratic and centralized government captured by the rich region, determines the taxation and public expenditures. First, despite his selfishness, the autocrat refrains from diverting too much tax revenue because it is used to produce public goods that are an input into the production process. If he is too greedy, production declines and there are fewer rents to extract. When taking into account that national wealth is endogenous, rent extraction is limited by the need to produce enough public goods to support it.

Second, the paper compares two fiscal regimes. Under centralization, both national and local investments in public good, uniform across regions, are chosen by the central government and are financed by national taxes. Under decentralization, local investment in public good is financed by local taxes, chosen by the local government, while the national investment in the public good remains chosen by the central government and financed by central taxes. We show that when power resides in the rich region and is centralized, productivity inequality between the two regions is the highest. Inequality is minimized when either central power resides in the poor region, as would be the case in a median voter-led democracy, or when it is decentralized.

The intuition for this result is the following. In the case of centralization, the autocrat chooses the level of local and national investment in the public good to maximize the productive efficiency of the wealthy region to which he belongs. The complementarity of national and local investments implies that, from the poor region's point of view, there is over-investment at national level and under-investment at local level. This mismatch means that, with autocratic centralization, the per-capita level of public good available in the poor region is lower than in the rich region. As the public good is a factor of production, the productivity gap between the two regions increases with autocratic centralization, and becomes greater than the initial productivity gap resulting from differences in

capital stock. For the autocrat, in case of stability, the trade-off is therefore between productive efficiency, which calls for decentralization, and rent extraction, which is easier with centralization. He chooses decentralization when the efficiency cost of centralization is high, which is typically the case when the poor region is large (e.g., rural China). The situation is different when the median voter residing in the poor region either chooses all taxes, as is the case during a transition to democracy or, more interestingly, when decentralization is implemented. In the latter case, both regions can adjust their local investment to match investment at national level, so that the productivity gap between them does not widen.

The paper examines next how the threat of political change (i.e., a transition to democracy) impact decentralization reform. We assume that the median voter residing in the poor region governs in the case of a transition to democracy. A key result of the paper is an equivalence result: the median voter under democracy is indifferent between centralization and decentralization because the productivity of the poor region is the same in both cases. This is in contrast to the situation in the rich region. When power shifts from rich to poor regions, the welfare of the former autocratic elite is higher with decentralization. Since reforms are costly, an authoritarian regime that fears democratization is well advised to implement fiscal decentralization reforms before the democratic transition, because the median voter will not. The latter has nothing to gain from decentralization if he is in power, while the former has much to lose if the regime remains centralized. This shows that decentralization in autocracies can occur as a means of protecting the elite from the fiscal decisions that would be implemented by a poor median voter.

Finally, once launched, decentralization reforms can influence the likelihood of rebellion and violent transition to democracy in two opposite ways. On the one hand, in the case of a likely popular uprising, decentralization reforms may influence citizens' willingness to revolt by mitigating their grievances and their need for greater local accountability. If this is indeed the case, decentralization can be

used by autocrats to stall the transition to democracy and serve as a palliative for authoritarian governments (Grindle, 2007). On the other hand, by increasing the amount of resources available to regions and enhancing their autonomy, a decentralization process might increase the likelihood that insurgent regions will win if they rebel, which could accelerate the transition to democracy. We explore this trade-off with our model and show that in our context the second effect generally dominates: decentralization does accelerate democracy.

In the last part of the paper we aim to assess the empirical relevance of the theory, namely that decentralization in autocracies can occur as a means of protecting the elite from the fiscal decisions that would be implemented by a poor median voter. We study with panel data covering 1980-2012 how social unrest and instability faced by an autocratic regime can affect fiscal reforms. We find that an increase in domestic and external political instability in past years is followed by greater fiscal decentralization, i.e. localities rely relatively less on central government transfers and more on their local taxes as a source of revenue. This empirical result is consistent with the prediction of the theory: non-democratic regimes tend to decentralize after being threatened by popular uprising and social unrest.

1.1 Link with the literature

To the best of our knowledge, this paper is one of the first to study theoretically decentralization reforms in autocracies. The fiscal federalism literature focuses on the welfare impact of decentralization, which is trading-off efficiency gains, notably a better match of expenditures to local preferences, and costs, in democracies where citizens can move freely and "vote with their feet" (see for instance Tiebout, 1956; Oates, 1972; Persson and Tabellini, 1996b,a; Ostrom et al., 1993, Besley and Coate, 2003; Seabright, 1996; Gomez-Reino and Martinez-Vazquez, 2013). The results of this theoretical literature have had considerable influence and inspired hundreds of decentralization programs, consid-

ered an important element of participatory democracy around the world (Bardhan and Mookherjee, 2006). Some studies hence show that democracy causally increases the level of fiscal decentralization (e.g., Bird and Vaillancourt, 2008 or Panizza, 1999), which is seen as a step and a means to achieve democratic ideals.

However this causal link between democracy and decentralization is challenged by others studies. This is illustrated, for example, by the decentralization reforms in Ethiopia (Kosec and Mogues, 2020), by those implemented in Pakistan by a military regime (Cheema et al., 2006), or by the success story of decentralized rural-industrial development of China (Lin and Liu, 2000). In fact, according to Xu (2011) "China's authoritarian regime is one of the fiscally most decentralized countries in the world". Similarly one of Argentina's most significant decentralization episode was engineered by an authoritarian government (Eaton, 2001), and one major Chilean decentralization reform occurred during Pinochet's autocratic regime (Ranis and Stewart, 1994). This raises the question of what might prompt decentralization reforms in autocracies, which this paper explores.

Our hypothesis that centralization does not respond effectively to local regional needs echoes a long tradition in the fiscal federalism literature (see Tiebout, 1956; Oates, 1972; Persson and Tabellini, 1996b,a; Ostrom et al., 1993, Besley and Coate, 2003; Seabright, 1996; Gomez-Reino and Martinez-Vazquez, 2013). Decentralization reduces the complexity, including the number of hierarchical levels, involved in managing public goods on the ground, and leads to a more efficient allocation of public goods. Transferring power to local governments increases efficiency because they have better information (Oates, 1993) and because it makes government more responsive to local needs, by "tailoring levels of consumption to the preferences of smaller, more homogeneous groups" (Wallis and Oates, 1988).

Empirically, the net impact of decentralization on welfare and productivity is ambiguous, as it depends crucially on the nature of local and national institutions, which may, for example, face

problems of accountability and capacity, especially in developing countries (Oates, 1993; Bardhan, 2002; Knack and Keefer, 1997; Treisman, 2002; Foster and Rosenzweig, 2002; Arze del Granado et al., 2012; Ahmad et al., 2005). Nevertheless, studies focusing on autocracies or weak democracies suggest (with heterogeneity in their results) that decentralization reforms tend to increase the provision of local public goods, including access to basic public services such as sanitation or electricity, or schooling and healthcare, but also training in agriculture (Kosec and Mogues, 2020). For instance, under Pinochet decentralization reforms Chilean municipalities were given increased autonomy over local tax raising and spending, notably in primary and secondary education and primary health care (see Ranis and Stewart, 1994, Parry, 1997, Van der Wal, 2007). Using an unbalanced panel data set of 59 developed and developing countries covering a 30-year period, Arze del Granado et al. (2012) find that expenditure decentralization positively and significantly influences the share of health and education expenditures in the consolidated government budgets. Kosec and Mogues (2020) provide a nice survey of 13 papers published in selected political science journals and economics journals on the impact of decentralization in non-democratic countries (defined as countries with a Polity IV score bellow 6). Their review shows heterogeneous results (mixed in majority and other positive), with only 3 of them negative. These nuanced empirical results reflect the great heterogeneity of the data and empirical strategy used in the papers.

Focusing on the impact of decentralization on growth, Canavire-Bacarreza et al. (2020), who criticize in their literature review the fact that many studies fail to address endogeneity issues, use an instrumental variable approach to address this problem and find a positive and significant impact of decentralization reforms on growth in developing countries. Focusing on China, Ding et al. (2019), exploit staggered introduction of Tax Sharing System (TSS) across regions and over time in the 1990s for their econometric identification. Their Difference-in-difference estimates suggest that TSS increased per capita GDP growth rates by 18%.

One of our main findings is that, decentralization in autocracies can occur as a means of protecting the elite from the fiscal decisions that would be implemented by a poor median voter. This result can be illustrated by several episodes of decentralization. For instance, studying the Colombian and Bolivian decentralization of the 1990s, O'Neill (2004) argues that they were due to national-party leaders forecasting low chances to hold on to the national executive on the future. Arzaghi and Henderson (2005) show that a credible threat of separation may "cause an increased in the willingness of the central government to share power and responsibility with regional governments", and provide empirical evidences of a positive correlation between democratic pressure and decentralization. [2] Sepulveda and Martinez-Vazquez (2011) suggest that richest populations might use decentralization to protect themselves from "unwanted re-distributive policies".

Finally, our empirical analysis on the impact of political instability on the decision to decentralize undertaken by an authoritarian regime builds on previous research. Giuliano et al. (2022) argue that threats to autocratic regimes, both internal and external, can push rulers to engage in nation-building and public good provision, such as mass education, national language policies, or compulsory military service, to reduce the risk of regime overthrow. Alesina et al. (2021) show that in reaction to internal threats of democratization, ruling elite have invested in national public goods, such as major educational reforms (as in France and Italy during the XIXth century), to promote nation-building and reduce the risk of separation. These attempts to homogenize the population through centralization and nation-building are consistent with our findings that an autocrat who wants to retain power will not decentralize, as this is a gas pedal of democratic transition, but will instead stick to centralization.

The rest of the paper is organized as follow. Section 2 presents the model. Section 3 studies the productivity gap between the two regions under centralization and decentralization. Section 4 studies the optimal decentralization reform in the case of a stable autocracy. Section 5 studies the optimal

[2] In Arzaghi and Henderson (2005) decentralization is used strategically to avoid a full-blown secession in the future, the latter implying for the poor not being able to benefit from the resources of the richer regions, while in our model the rich want to get rid of the poor by decentralizing when democratization seems inevitable.

decentralization decision in the case of a planned transition to democracy, while section 6 studies the decentralization decision when this transition is uncertain. Section 7 provides empirical evidences in support of the theory. Finally, section 8 concludes.

2 The model

We consider a country with two regions, $r = H, L$ and two goods, one private and the other public, whose availability varies locally. The population of region r is N_r and the national population is N: $N_H + N_L = N$. We denote by $n_r = \frac{N_r}{N}$ the share of the population residing in region r: $n_H + n_L = 1$.[3] By assumption, the most populous region is L:

Assumption 1. $n_L = 1 - n_H \in \left(\frac{1}{2}, 1\right)$

Individuals' preference: Individuals all have the same preferences over the two goods. This includes the Autocrat, who lives in region H. As it is standard in public economics, we assume that individuals preferences are separable between publicly provided goods and own purchases of private good (i.e., preferences are quasi-linear). To be more specific, the utility of an individual from region $r = \{H, L\}$ with private consumption $x_r \geq 0$ and access to public good g_r is:

$$u(g_r, x_r) = \gamma v(g_r) + x_r \tag{1}$$

where $v(g)$ is an increasing, strictly concave function of $g \geq 0$ and with $0 \leq \gamma \leq 1$. To keep the presentation simple, in the main text we focus on the case where $\gamma = 0$, so that the utility of the representative agent of region r is simply her level of consumption of the private good: $u(g_r, x_r) = x_r$.[4] However the proofs in the appendix are derived with a positive γ, which allows us to discuss how our

[3] We are focusing on a poor autocratic country where most people make their living from agriculture and are not free to move to wherever they want. The situation is obviously different in a country with democratic institutions, where individual mobility is guaranteed, as the literature on fiscal federalism points out.

[4] The payoff of the autocrat and of the agents is describe below.

core results are affected by γ's increase, that is, by a higher individual's valuation of the public good. Our results are illustrated with the example of a power function. Neither the quasi-linear form in (1), nor the power functional form used as an illustration in the appendixes are crucial for our results.[5]

Production functions in the private sector: While most papers on decentralization simply assume that the regions' gross revenue, and therefore the level of taxable income, are fixed, one important contribution of the paper is to endogenize them. The private good is produced in both regions with a constant return to scale technology, as is generally the case in agriculture or manufacturing, with the help of three inputs, capital, labor, and public good. The production function, strictly increasing and concave in its arguments, is therefore homogeneous of degree 1. To keep the exposition simple, we further assume that the input elasticities of production are constant. Reynès (2019) shows that all production functions satisfying these assumptions are Cobb-Douglas functions. Without loss of generality, we show in Appendix 9.1 that the per capita production in region $r = H, L$ can be written:

$$y_r = a_r(g_r)^{\phi} \qquad \text{with } \phi \in (0,1), \tag{2}$$

where g_r is the per capita level of public good and a_r depends on the stock of capital available locally. By assumption, region H is richer and more productive than region L (i.e., it is the region endowed with the largest stock of capital):

Assumption 2. $1 \leq a_L < a_H$.

The average national per capita production is: $y = n_H y_H + n_L y_L$.[6]

Public goods production function: In line with empirical evidence, the level of locally available public good, g_r, depends on a combination of local and national investments. Typically we're looking here at a national training program (e.g. for teachers, nurses, doctors, etc.) and a program to build and

[5] Our core results are robust to other utility functions, for instance Cobb-Douglas type, as shown in the on-line Appendix 11.1.

[6] The private good national production is $Y = N_H y_H + N_L y_L$. Dividing by N yields $y = n_H y_H + n_L y_L$.

equip premises to accommodate them locally (e.g. schools, dispensaries, etc.), or a funding program to finance a national infrastructure (e.g. a transport network consisting of highways and airport and/or port) and another to build local roads to connect to it. When decentralization takes place, it involves investment in local health care facilities, schools or local infrastructure such as secondary roads or utilities services (see Zhuravskaya, 2000 for evidence in Russia and Xu, 2011 for China). Complementary public goods, such as the construction of main roads and highways, selection and training programs for teachers, nurses and doctors, are all provided at national level.[7] These public investments are complementary: investments in national programs are only useful in the regions if they are matched by investments at local level, and vice versa. For example, there is no point in having an international port, an airport, or a main highway if there are no secondary roads to connect the centers of production and consumption to the national infrastructure. Similarly, national training programs for nurses, doctors and teachers, as well as national universities, are useless if there are no local primary and secondary schools, dispensaries and hospitals. Leontief's production function accounts for the complementarity between the two types of investment. The per-capita level of public good available in region $r = \{H, L\}$ is :[8]

$$g_r = \min\{Q, q_r\}, \tag{3}$$

where $Q \geq 0$ is the per capita investment in the national program (or infrastructure) and $q_r \geq 0$ is the complementary per capita investment makes locally.

Autocrat payoffs in the different political regimes: Initially, the country is centralized and ruled by an autocrat residing in region H, who chooses the level of taxes and whether or not to implement a decentralization reform. The autocrat finances his consumption by embezzling a share $b \in [0, 1]$ of the

[7] Authoritarian regimes, such as the Chinese Communist Party, control high economic sectors (e.g. telecommunication, energy, railways) as well as ideology, notably through teachers training and national programs (Xu, 2011).

[8] We focus on per capita level of public good because of congestion effect. The absolute level is not informative as its impact depends on the size of the population. It is not the same to spend 1 billion on schools in China and in Chile.

total tax revenue T. He keeps a share $s \in [\frac{1}{N_H}, 1]$ of the bribes, and share equally the rest among the residents of H. The budget constraint for bribes is therefore $bT = sbT + (1-s)bT$, where the first term, sbT, is the autocrat's payoff and hence private consumption, and the second term, $(1-s)bT$, is the bribes he distributes equally to his supporters (they all get a fraction $1/N_H$ of it).[9] Through this patronage economy, he buys the support of the region H in order to ensure political stability: a citizen of region H private consumption is equal to the region H per capita production plus share of bribes, minus taxes. The autocrat chooses the tax rates and the embezzlement rate b to maximize bT in each fiscal regime.[10]

If the autocracy is stable, the autocrat compares the centralized and decentralized cases and by backward induction he chooses the regime that maximizes his final payoff. If autocracy is unstable, he also considers the possibility of a democratic transition. In the case of a transition to democracy, the former autocrat's embezzlement level drops to 0 and he becomes an ordinary citizen of region H with a representative agent payoff (minus a possible penalty cost in the case of a violent transition). In a democracy, the median voter in the poor region L chooses the tax rate t and the regime between centralization and decentralization that maximize her private consumption, which is equal to the per capita production of the private good in region L minus the taxes.

Tax schemes and the financing of public goods: Public revenues originate from linear taxes levied on the private sector, and are used to finance the public good.[11] The objective of this paper is to compare two fiscal regimes, centralized and decentralized. Our definition of such regimes follow Besley and Coate (2003). The tax embezzlement rate $b \in [0, 1]$, which is endogenous and strictly positive under an autocracy, falls to 0 in a democracy.

[9] There are two relevant limit cases: when $s = \frac{1}{N_H}$, the bribes are shared equally between all citizen in H, so that the autocrat payoff is $\frac{bT}{N_H}$, when $s = 1$ the autocrat is greedy and keeps everything for himself, so that his payoff is bT.

[10] The autocrat wants to maximize his share of the pie, sbT, which is equivalent to maximize bT.

[11] We assume that the governments can borrow at the beginning of the period to finance the public goods, and reimburse at the end the debt with the taxes collected. To simplify the exposition we normalize the interest rate at 0.

- *Centralization:* When the regime is centralized, the central government collects all taxes and chooses how to allocate them between national and local investments to produce the public good. For ease of comparison with the decentralized case, we consider two taxation rates, labelled t and τ,[12] to finance the national, $Q = (1-b)ty$, and the local, $q_r = (1-b)\tau y_r$, investments respectively, uniform across regions. The total tax revenue under centralization is $T = (t+\tau)Ny$ with $t+\tau \leq 1$ (i.e., what is taxed cannot be larger than what is produced). The region $r = \{H, L\}$ that has the power chooses the level of local investment in the public good that maximizes its productivity $\tau = \frac{ty}{y_r}$.[13] If power lies in region H, as in the initial autocratic situation, then $\tau = t\frac{y}{y_H}$ so that $Q = q_H > q_L$. This implies $g_H = (1-b)ty > g_L = \frac{y_L}{y_H}(1-b)ty$. If region L comes to power through a democratic transition, then $\tau = t\frac{y}{y_L}$ so that $Q = q_L < q_H$. This implies that $g_H = g_L = ty$.

- *Decentralization:* In decentralization, the national government collects taxes at rate t to finance the national investment, $Q = (1-b)ty$, while local governments independently choose and collect local taxes at rate τ_r to finance their local investments, $q_r = (1-b)\tau_r y_r$, with $r = \{H, L\}$. The total tax revenue under decentralization is $T = (ty + \tau_H n_H y_H + \tau_L n_L y_L)N$ with $t + \tau_r \leq 1$. Each region $r = \{H, L\}$ set τ_r so that $\tau_r = \frac{ty}{y_r}$.[14] We deduce that, under decentralization, whether the regime is autocratic or democratic, the local investment in public good in each region perfectly complement the investment made at the national level: $Q = q_H = q_L$, which is efficient. The level of public good is $g_H = g_L = (1-b)ty$ under an autocratic rule and is $g_H = g_L = ty$ under a democratic one.

Table 1 summarizes the tax rates and the levels of public goods, g_H and g_L, locally available in each regime. The next section analyses how these tax regime affects the productivity in each region.

[12] It is equivalent to consider a uniform tax rate and an allocation rule of this tax revenue between global and local investments. We use the other approach as it makes comparisons with the decentralization case easier.

[13] In autocracy τ is set so that $(1-b)ty = (1-b)\tau y_H$ and in democracy it is so that $ty = \tau y_L$.

[14] They set set τ_r so that $Q = (1-b)ty = (1-b)\tau_r y_r = q_r$, with $b = 0$ in democracy.

Table 1: Tax rates and investment in public goods in region H and L

	Centralization $g_H \geq g_L$	Decentralization $g_H = g_L$
Autocracy	$\tau = \frac{ty}{y_H} \Rightarrow g_H = (1-b)ty > g_L = (1-b)\frac{y_L}{y_H}ty$	$\tau_r = \frac{ty}{y_r} \Rightarrow g_H = g_L = (1-b)ty$
Democracy	$\tau = \frac{ty}{y_L} \Rightarrow g_H = g_L = ty < \frac{y_H}{y_L}ty$	$\tau_r = \frac{ty}{y_r} \Rightarrow g_H = g_L = ty$

3 Regional productivity gap in (de)centralization

The model rests on the assumption that it is impossible (i.e. very costly), in the centralized system, for the ruler to adapt the investments in the public good to the local regional conditions. This assumption is consistent with the fact that problems of complexity, access to information and incentives are difficult to overcome in practice in a centralized system (Wallis and Oates, 1988; Oates, 1993). This is particularly true in autocracies where, in the absence of a free press and democratic institutions, information flows poorly. For instance, focusing on the autocratic regime in Ethiopia, Kosec and Mogues (2020) explains that prior to decentralization reform, the central government dictated the provision of local public goods in a highly standardized manner, without regard to jurisdictional needs. Interestingly, in a democratic context, this assumption is a principle of the law. One of the foundations of the legal framework for taxation in a democracy is that taxes must be applied impartially in the jurisdiction that sets them, whether local or national. This implies that when the richest region H has the power to set all taxes, it will choose an investment scheme that is inefficient for the poorest region L and conversely when the poorest region L chooses all taxes. In contrast, under decentralisation, local investment in the public good and the revenues raised to finance it are decided at the local level, allowing each region to match its local investment level to that of the national level, which is efficient in terms of public expenditure.

The inefficiency inherent in the centralization rule implies that the productivity gap between the two regions is maximal in autocracy since $g_H > g_L$ as shown in Table 1. The productivity gap between the two regions is smaller in the other regimes since $g_H = g_L$. In the appendix, we thus show the

following result. It is valid whether the regime is democratic or autocratic.

Proposition 1. *Let* $\Phi = \frac{1}{1-\phi} > 1$. *When the regime is centralized and lies in* H, *then*

$$\frac{y_H}{y_L} = \left(\frac{a_H}{a_L}\right)^{\Phi} \tag{4}$$

When the regime is either decentralized, or centralized and lies in L, *then*

$$\frac{y_H}{y_L} = \frac{a_H}{a_L} \tag{5}$$

Proof: See Appendix 9.2.

Assumption 2 returns that $\frac{a_H}{a_L} \geq 1$. Since $\Phi > 1$,[15] comparing equations (4) and (5), the productivity gap between the two regions is largest when the regime is centralized and the rich region chooses all tax rates. It is smaller when the regime is centralized and lies in the poor region L or when the regime is decentralized. The intuition for this result is the following.

Since regions are heterogeneous, they have different optimal combination of local and national investments. With centralization the region that has the power to set all taxes imposes its optimal combination on the other region, which suffers a productivity loss compared to decentralization, where it can freely adapt its local investment. In centralisation, the autocrat chooses a level of investment that corresponds to the needs of the rich region. From the poor region's point of view, there is over-investment at national level and under-investment at local level. Indeed, as shown in the first row of the first column of table 1, the local level of investment in the public good production in region L is too small, and the poorest region would like to compensate its low productivity by a higher local investment. With autocratic centralization, the level of public good available in the poor region is therefore lower than in the rich region. As the public good is a factor of production, the productivity

[15] For instance if $\phi = 0.5$ then $\Phi = 2$.

gap between the two regions increases with autocratic centralization, and becomes greater than the initial productivity gap resulting from differences in capital stock.

The situation is different when the median voter residing in the poor region chooses all taxes, as is the case in a transition to democracy. She chooses a level of local and national investment in the public good that perfectly complements each other in region L. Rich and poor regions then have access to the same level of public good, even if for the rich region local investment in the public good is excessive in relation to national investment as shown in the second row of the first column in table 1. This excessive investment is a waste for the rich region that would prefer instead higher national investment. In other words, the region H is being imposed an over-investment in local schools, local roads, dispensaries and an under-investment in higher education, highways and university hospitals (and symmetrically for region L when region H is in charged). This implies that the poorest region is capable with centralization of maintaining its initial productivity gap in the event of democratisation.

Finally, when decentralization is implemented, both regions can adjust their local investments to match those at national level, so that they benefit from the same level of public goods per capita and the productivity gap between them does not widen. When it has the power to set local taxes, the poorer region compensates for its lower private productivity with a higher level of local public investment, and therefore a higher local tax rate. Consequently, the productivity gap between the two regions is the same when centralization is in place and the poor region chooses all taxes, or when decentralization is in place. Compared to an initial situation with a centralized government holding power in the rich region, as is common in autocracies, decentralization reduces productivity inequalities.

4 Stable autocracy

In the initial situation, the regime is a stable autocracy, with no prospect of political change. The autocrat belongs to the rich region H, and uses his power to extract a share b of the total tax revenue T. He keeps a share $s \in [\frac{1}{N_H}, 1]$ of the bribes, and share equally the rest among his followers of H. The autocrat, who produces nothing, chooses the tax t and the bribe rate b, and whether to decentralize or not, to maximize the utility:[16]

$$u_A(g_H, sbT) = sbT \tag{6}$$

4.1 Centralized autocracy

In the case of centralization, Proposition 1 implies that the final gap in productivity between the two regions is $\frac{y_H}{y_L} = \left(\frac{a_H}{a_L}\right)^{\Phi}$, which is larger than $\frac{a_H}{a_L}$, the initial productivity gap. We deduce from the first row, first column of Table 1, and from Proposition 1, that $T^c = \left(1 + n_H + \left(\frac{a_L}{a_H}\right)^{\Phi} n_L\right) tNy^c$, where y^c is the endogenous per capita private production under centralization. The autocrat chooses b and t so as to maximize the utility function defined in (6) for tax revenue T^c.

Lemma 1. *Let $E(a^{\Phi}) \equiv n_H a_H^{\Phi} + n_L a_L^{\Phi}$ with $\Phi = \frac{1}{1-\phi}$. Under centralization the autocrat chooses the taxation rates*

$$t^c = 1 - \tau^c = \frac{a_H^{\Phi}}{a_H^{\Phi} + E(a^{\Phi})} \tag{7}$$

and the embezzlement rate

$$b^c = \frac{1}{\Phi} \tag{8}$$

so that

$$U_L^c \leq U_H^c \leq U_A^c. \tag{9}$$

Proof See Appendix 9.3.

[16] Our proofs are derived in the general case where the utility of the autocrat is: $u_A(g_H, x_A) = \gamma v(g_H) + x_A$ with $x_A = sbT$ and $\gamma \in [0, 1]$. To ease the exposition in the main text we set $\gamma = 0$.

The autocrat will never set $b = 1$ because public goods are an input in the production function of the private sector, as well as a source of utility for the people, including him. There is a trade-off between keeping taxpayers money for his own benefit and the benefit of his followers, and producing enough public goods so that the production to be taxed is not too low. In other words, being too greedy is not optimal. Therefore the optimal bribe rate obtained in (8) is smaller than one, and it decreases with Φ (i.e., with ϕ the productivity of the public good in the production process of the private good).[17] We show in Appendix 9.3 that the embezzlement rate b^c also decreases with γ, which is an intuitive result. When the public good enters directly into the autocrat's utility function, he is more concerned with its production, since it has a consumption value, in addition to its impact on productivity. Therefore the autocrat diverts fewer bribes to enable greater production of the public good when the utility derived from consumption of the public good increases.

Finally (9) implies that, under a centralized regime, the autocrat has the highest utility of all. Citizens in the rich region come next, while citizens in the poor region have the lowest utility. As shown in Appendix 9.3, if the autocrat shares the bribes equally with people in region H (i.e., to enlist their support to maintain his hold on power), then $s = \frac{1}{N_H}$ and $U_H^c = U_A^c$. By contrast, if the autocrat can afford to be greedy because the autocracy is stable, he keeps all the diverted public funds for himself so that $s = 1$ then $U_H^c < U_A^c$.

4.2 Decentralized autocracy

In the decentralization case, t is uniform across regions, but the tax decisions for local investment in the public good are decentralized such that $\tau_r(t) = \frac{ty}{y_r}$, implying $\tau_H < \tau_L$. This imposes a constraint on the central government's ability to tax region L. In fact, what is collected and invested locally in the poor region is relatively larger than what is collected and spent locally in the rich region. This means that under decentralization, the budget constraint binds first in the poor region, $t = 1 - \tau_L$,

[17] It is equal to $b^c = \frac{1}{\Phi} = 1 - \phi$.

which limits the tax scheme that the autocrat can implement in the rich region: The national tax rate is $t = 1 - \tau_L < 1 - \tau_H$ such that the citizens in the rich region H are left with a rent. The autocrat does not like the loss of control over tax collection and spending implied by decentralization.

We deduce from the first row, second column, of Table 1 and Proposition 1 that $T^d = 2tNy^d$, where y^d is the private per-capita production under decentralization. The autocrat chooses b and t so as to maximize the utility function defined in (6) for tax revenue T^d.

Lemma 2. *Let $Ea \equiv n_H a_H + n_L a_L$. Under decentralization, the autocrat chooses taxation rates*

$$t^d = 1 - \tau_L^d = \frac{a_L}{a_L + Ea} \tag{10}$$

and a bribe rate

$$b^d = \frac{1}{\Phi} \tag{11}$$

so that $U_L^d < \min\{U_H^d, U_A^d\}$. Moreover $U_A^d \geq U_H^d$ if and only if

$$s \geq \frac{1}{N_H}\left(1 + \frac{N_H - 1}{N}\frac{a_H - a_L}{a_L}\frac{\Phi}{2}\right) \tag{12}$$

Proof See Appendix 9.4.

As under centralization, the optimal bribe rate obtained in (11) is smaller than one, and it decreases with Φ. We show in Appendix 9.4 that it also decreases with γ, an intuitive result.

Under a decentralized regime, citizens in the rich region (autocrat included) have a higher utility than those in the poor region. However the autocrat could end up with a lower utility level than that of the representative agent of the rich region H, depending on how the autocrat shares the rents diverted from the taxes. If he shares them equally with his supporters in H (so that $s = \frac{1}{N_H}$), then $U_H^d > U_A^d$. Agents in region H have the highest utility as they get the embezzlement rents plus the rents linked to their production of private goods, followed by the autocrat, and next by agents in

region L. This result reflects the fact that under a decentralized regime the autocrat is limited in his ability to extract rents from the people. Conversely, whenever the autocrat is greedy and keeps all the diverted taxes for himself (so that $s = 1$), then (12) is true if and only if $N \geq \frac{a_H - a_L}{a_L} \frac{\Phi}{2}$. This condition holds if the total population is large or the productivity gap between the two regions and Φ are not too large. By contrast if a_H is much larger than a_L or Φ is very large (i.e., ϕ is close to 1) then one may have $U_A^d \leq U_H^d$ even when $s = 1$.

4.3 Comparison of regimes

Comparing results from Lemma 1 and 2, we show in Appendix 9.5 that $t^c \geq t^d$. This result is general and holds for $\gamma > 0$. With decentralization, the autocrat loses control over local tax levels and spending, which means he loses control over the allocation of a fraction of the surplus from private production. As the poorer region invests relatively more locally than the richer region to try to compensate for its lower productivity, the national tax is determined by the budget constraint of the poorer region. This loss of control over a part of the rents explains why the autocrat does not like decentralization. The latter regime is more efficient in term of total national production, but forces the autocrat to relinquish rents to the inhabitants of region H, which explains that sometimes they can be better off than the autocrat himself. From the autocrat's point of view, the choice of fiscal regime is the result of a trade-off between efficiency and rent extraction.[18]

Comparing results from Lemma 1 and 2, we also see that $b^c = b^d$. This equality result is an artifact of the assumption that $\gamma = 0$. When $\gamma > 0$, it is logical that the rate of embezzlement should decrease under both decentralization and centralization. Appendix 9.5 then shows that b^c can be lower or higher than b^d depending on the value of the parameters. For instance, whenever $v(g) = g^\phi$, the bribe rate is higher under a centralized regime than under a decentralized one, $b^d \leq b^c \leq \frac{1}{\Phi}$, for $\frac{a_H}{a_L} \geq \frac{2}{n_H}$.

[18] Guirkinger and Platteau (2015)'s work on the patriarchal family analyzes a similar trade-off, where a patriarch (autocrat) decides about how to allocate family land between collective and individualized plots, given that he can extract his rent from collective family farming only. See also Guirkinger et al. (2015).

By virtue of Proposition 1, the centralized regime returns the highest productivity gap between the two regions (compared to decentralization). It also yields the highest level of embezzlement by the autocrat, whenever the productivity gap between the two regions is large enough and $\gamma > 0$. On the other hand, if n_L is large (i.e. close to 1 so that n_H is close to 0), then the converse is true: $b^c \leq b^d \leq \frac{1}{\Phi}$. When the rich region is of negligible size and $\gamma > 0$, the autocrat moderates the share of total tax revenues he siphons off under centralization in an attempt to sustain the level of production of public goods.

Comparing the utility of the autocrat in the two regimes, we obtain the proposition 2.

Proposition 2. *The autocrat prefers centralization over decentralization if and only if*

$$\frac{\left(E(a^{\Phi})\right)^{\Phi}}{\left(a_H^{\Phi} + E(a^{\Phi})\right)^{\Phi-1}} \geq 2\left(\frac{a_L E(a)}{a_L + E(a)}\right)^{\Phi} \tag{13}$$

Proof: See Appendix 9.6.

There exist many situations such that condition (13) holds. For instance, we show in Appendix 9.6 that if $\frac{a_H}{a_L}$ is sufficiently large then condition (13) always holds. To see this result, it is sufficient to look at the limit case where $\frac{a_H}{a_L} \to +\infty$. The left hand side of equation (13) goes to infinity, while the right hand side converge to 2. By continuity, the result still holds for large finite value of $\frac{a_H}{a_L}$. When the productivity gap between the two regions is very large, the autocrat has no interest in the production of the poor region, as it yields no taxable revenue. He therefore maximizes the bribes he can extract from the rich region, which is best achieve through centralization. Symmetrically, we show in Appendix 9.6 that if $\frac{a_H}{a_L} \to 1$, there is no benefit of decentralization, since the decisions that are optimal for the rich region are also optimal for the poor region, and the autocrat has no interest in decentralizing provided that n_H is not too low.

Conversely, we show in the Appendix 9.6 that if n_H is very small (i.e., converge to 0), then equation

(13) never hold and the autocrat prefers decentralization over centralization. When the main source of revenue for the autocrat comes from the poor region, he maximizes the productivity in this region through decentralization. that is, when region H is negligible in size, the high inefficiency induced by a centralized choice of local public goods in national production outweighs any other concerns, and the autocrat picks decentralization. This result helps us understand the Chinese government's choice to implement decentralized rural-industrial development reforms (Lin and Liu, 2000). This is a case of stable autocracy, where due to the size of the poor regions the economic cost of centralization outweighed the loss of control entailed by decentralization.

So far we have considered the situation of a stable autocracy. Yet a wave of democratic reform swept the world at the end of the Cold War. With East-West détente, the two superpowers withdrew their military support from many autocratic regimes, thus weakening them. A large number of autocrats became aware that their hold on power was fading, especially whenever a transition to democracy was already occurring in neighboring countries. We first study the reaction of an autocrat who anticipates the transition to democracy. Assuming he doesn't fight it with violence, but rather accommodates it, the autocrat can organize his future demise to his advantage. He can resign of his own accord, so that the transition is relatively smooth and peaceful. Such transitions have taken place in many autocratic countries when their leaders realized that transition was inevitable (e.g., in the former USSR, Chile, Paraguay).

5 Transition to democracy

If the country makes the transition to democracy, identified by a star (*), the median voter, who resides in region L, chooses both the taxation rates and the fiscal regime, i.e., whether to implement decentralization reforms or not. We can therefore compare easily the equilibrium outcome in democracy with the outcome in the autocratic case. In a democracy, decisions will be taken by the

citizens of region L, since by assumption A1 this is the most populous region. We assume that people are not mobile, for example because they work on their farms. This assumption that people do not necessarily vote with their feet even in democracy is, for instance, attested by Genicot et al. (2021) in the American context. We establish the following result.

Proposition 3. *Under democracy, the utility of the representative agent of region L is the same when either centralization holds and the poor region chooses both all local and national taxes, or when decentralization holds and it chooses the national tax and region L local tax only:*

$$U_L^{d*} = U_L^{c*} \tag{14}$$

Proof: See Appendix 9.7.

The result of Proposition 3, which is key to our analysis, is fairly robust in the sense that it does not depends on the specific shape of the preferences of the voters. In particular it holds when $\gamma > 0$ as shown in Appendix 9.7. It also holds if the preferences of the voters are Cobb-Douglas as shown in Proposition 6 in the on-line Appendix 11.1. On the other hand, it depends on the result of the Proposition 1 showing that the productivity gap between the two regions is identical when the regime is decentralized or when it is centralized and region L chooses all taxes. It implies that the representative citizen of region L is indifferent between centralization and decentralization when the decision power lies in L.

Conversely, citizens in H do care about the fiscal regime in place. As shown in Appendix 9.8, the utility of the representative agent of region H in the centralization case is $U_H^{c*} = \frac{a_H}{a_L} U_L^{c*}$. Since $a_H \geq a_L$, comparing this value with (14) returns that $U_H^{c*} \geq U_L^{c*}$. The representative citizen of the rich region has a final net utility higher than the representative agent of the poor region. However, inequalities between regions H and L decrease with the transition to democracy, especially in the case of centralization, mainly because the utility of the representative agent of region H decreases more

with centralization than with decentralization.[19] We establish our main decentralization result.

Proposition 4. *If the autocrat in region H anticipates the transition to democracy, he will implement decentralization ahead of democratization reform, since by virtue of Proposition 3, the median voter in region L has no incentive to decentralize, and since*

$$U_H^{d*} = \left(1 + \frac{a_H - a_L}{a_H} \frac{Ea}{a_L + Ea}\right) U_H^{c*} \geq U_H^{c*}. \tag{15}$$

Proof See Appendix 9.8.

As shown in Appendix 9.8 this result, which is a corollary of Proposition 3, holds when $\gamma \in [0, 1]$. It also holds when the voters have Cobb-Douglas preference as shown in Proposition 6 of the on-line Appendix 11.1. In other words the decentralization result of Corollary 4 does not depend on the specific shape of the utility function. Nor does it depend on the homogeneity of regions H and L, as long as tax rates are set to optimize the productivity of public good investments in the region in power. To see this point, suppose we have the same proportion of rich and poor in the population (i.e., n_H and n_L are the same), but now the rich region has a small share of low productivity agents, and symmetrically in the poor region there is a small share of high productivity agents. This scenario is equivalent to having a lower productivity parameter for the rich region and a higher productivity parameter for the poor region.[20] According to Proposition 2 greater local heterogeneity, since it reduces the productivity gap between the two regions, will make decentralization reforms less efficient and therefore less attractive. However, since our results do not depend on the exact values of a_H and a_L as long as they satisfy our assumptions, our results in Proposition 3 and Corollary 4 are

[19] That is, $\frac{U_H^{c*}}{U_L^{c*}} = \frac{a_H}{a_L} \leq \lim_{\gamma \to 0} \frac{U_H^c}{U_L^c} = +\infty$.

[20] That is, $a'_H = \frac{(1-h)n_H a_H + l n_L a_L}{(1-h)n_H + l n_L} \leq a_H$ and $a'_L = \frac{h n_H a_H + (1-l) n_L a_L}{h n_H + (1-l) n_L} \geq a_L$, where l is the share of low productivity agents residing in region H and h is the share of high productivity agents residing in region L. We assume that these values are sufficiently small so that the median voter is still in the poor region and $a'_H > a'_L$. Then the endogenous level of production of the private good decreases in the rich region and increases in the poor region, making their optimal level of local investment in the public good, $\frac{\tau y'}{y'_r}$, more similar. It is still excessive for the rich region in the democratic centralized regime and insufficient for the poor region in the autocratic one. With decentralization, it is efficient.

unaffected. When the median voter of region L is in power, she is indifferent between centralization and decentralization as they lead to the same production of public and private goods for region L. She has no incentive to decentralize, as this would not increase her utility.[21] On the other hand, agents in the wealthy region H are strictly better off with decentralization. Within the framework of democracy, the citizens of H prefer decentralization because it enables them to extend their initial productivity advantage over the poor region: the production of private goods in region H is higher in the case of decentralization than in the case of centralization. An autocrat who anticipates a transition to democracy should therefore go ahead and implement decentralization before the regime change.

Corollary 4 sheds a new light on the joined process of democratization and decentralization that swept through the planet in the last three decades of the XXth century. When power lies in the hand of a wealthy minority, as it is the case in most developing, transitioning and emerging countries, the elite captures most of the benefit of taxation and public investments. Yet, with the emergence of democratic governments, the elite fear to be expropriated of their wealth by the median voter, who resides in a poorer region. An autocratic regime which foresees a change of regime towards democracy has incentives to implement decentralization before the transition. Indeed, decentralization allows greater latitude to optimize public investment to meet the needs of the elite and protect their wealth from the taxation policies of the poorer region.

6 Strategic decentralization

Up to now, we've considered a case where a future democratic transition was certain. In practice, however, such events are rarely set in stone. They are subject to shocks and are random. In what follows, we examine how our results are affected by this uncertainty.

[21] In practice, the reform is costly to implement. Taking into account a fixed cost would deter the median voter from implementing a decentralization reform from which she will not benefit.

6.1 Exogenous transition to democracy

We start focusing on situations where the probability to undergo a future democracy is exogenous. There exist examples of external forces and events, such as the end of the Cold War, or a revolution in neighbor countries with contagion effects such as the Arab spring, that foster the transition to democracy. When the autocratic state is centralized, the dictator stays in power with probability α_c, while he is kicked out by a revolution with probability $1-\alpha_c$. When decentralization reforms are implemented at the beginning of the period, the autocrat stays in power with probability α_d, and is overthrown with probability $1-\alpha_d$. In both cases, should a revolution succeed, it will lead to a transition to democracy whereby the median voter, belonging to region L, comes in power. Under democracy, the autocrat has no power and gets the utility of a representative citizen of region H, minus a sanction cost $K \geq 0$: K measures the (additional) cost to the autocrat of a violent transition to democracy, compared with a peaceful one.

In a context of civil instability, $\delta \equiv \alpha_d - \alpha_c$ therefore represents the *strategic effect* of decentralization, i.e., the impact of a decentralization reform on rebellion. Whenever $\delta > 0$, decentralization allows the regime to stay in power with a larger probability than centralization. By contrast, decentralization is an accelerator of democratization whenever $\delta < 0$, and it is neutral whenever $\delta = 0$.

We now turn to study the optimal decentralization policy from the autocrat point of view. If the autocrat clings to power and the fiscal regime is centralized, he obtains an expected utility of $V_A^c = \alpha_c U_A^c + (1-\alpha_c)\big(U_H^{c*} - K\big)$, while if the regime is decentralized, his expected utility is $V_A^d = \alpha_c U_A^d + (1-\alpha_c)\big(U_H^{d*} - K\big) + \delta(U_A^d - U_H^{d*} + K)$.[22] Assuming he sticks to his autocratic rule, the autocrat chooses decentralization whenever $V_A^d - V_A^c > 0$, which is equivalent to

$$0 \quad < \quad (1-\alpha_c) \underbrace{\left[U_H^{d*} - U_H^{c*}\right]}_{\geq 0} + \alpha_c \left[U_A^d - U_A^c\right] + \delta \left[U_A^d - U_H^{d*} + K\right] \tag{16}$$

[22] That is, $V_A^d = \alpha_d U_A^d + (1-\alpha_d)\big(U_H^{d*} - K\big) = \alpha_c U_A^d + (1-\alpha_c)\big(U_H^{d*} - K\big) + \delta(U_A^d - U_H^{d*} + K)$.

The autocrat sets his optimal decentralization reform based on three effects:

- $U_H^{d*} - U_H^{c*}$ represents the gain of any agent H from being in a decentralized state (versus centralized) under democracy. As shown in (15), it is always positive.

- $U_A^d - U_A^c$ is the difference in the autocrat's rent between decentralization and centralization. As can be seen in Proposition 2, it is often negative.

- $\delta \left[U_A^d - U_H^{d*} + K\right]$ represents the autocrat's gain or loss of using decentralization reforms as a populist reform.

The result of Corollary 4 can be obtained by setting $\alpha_c = \alpha_d = 0$, and therefore $\delta = 0$, in equation (16). In other words, an autocrat who faces a probability one of being overthrown regardless of the fiscal regime in place will always choose to implement decentralization.[23] By contrast, if the autocracy is extremely stable ($\alpha_c = \alpha_d = 1$ and therefore $\delta = 0$ again), the result of Proposition 2 holds, and the autocrat implements decentralization if and only if inequality (13) is true. By continuity, when α^c decreases it favors decentralization reforms. In other words, our results show that a growing threat of democratization drives the autocratic ruler to implement decentralization reform. We will assess the relevance of this prediction in the empirical section.

6.2 Endogenous transition to democracy

Let's now look at situations whereby the democratization process is endogenous, that is, whenever the autocrat's political and fiscal policies can affect social unrest and popular uprisings. In the context of our base case model, we provide micro-foundation in Appendix 9.9 to justify that the poor region always chooses to rebel, since the representative agent of region L is held at her reservation utility, normalized to 0, under the autocratic rule. The probability that the autocrat will be overthrown

[23] If he can he will first implement decentralization and second a peaceful transition to democracy when $\alpha_c = \alpha_d = 0$ as $\max\{V_A^c, V_A^d\} = U_H^{d*} - K < U_H^{d*}$.

therefore depends on the probability that the poor region will win the conflict. Provided the representative agent of the rich region prefers the status quo of the autocracy to a transition to democracy, which requires that $U_H^d > U_H^{d*}$, we consider a standard contest function whereby the probability for the poor region to win the conflict is $\frac{n_L y_L^j}{n_H y_H^j + n_L y_L^j}$ with $j = \{c, d\}$.[24] That is, the ability of the poor region to overthrow the autocratic regime depends on the relative amount of resources it can devote to the battle, compared with the amount of resources available in the rich region. By contrast, if $U_H^d \leq U_H^{d*}$, the people of the rich region do not fight, so that the probability of transition is 1. Let

$$k = \frac{a_H}{a_L} \geq 1 \tag{17}$$

be the productivity gap between the two regions. We deduce that by virtue of Proposition 1 in our base case where $\gamma = 0$ decentralization is an accelerator of democratization: $\delta = \frac{n_H k}{n_H k + n_L} \mathbb{1}_{\{U_H^d > U_H^{d*}\}} - \frac{n_H k^\Phi}{n_H k^\Phi + n_L} < 0$, where $\mathbb{1}_{\{U_H^d > U_H^{d*}\}}$ is a function that takes the value 1 if $U_H^d > U_H^{d*}$ and 0 otherwise. The autocrat has more power to fight a rebellion in the case of centralization because the productivity gap between the two regions (defined by k^Φ) is higher than with decentralization (where it equals k). By continuity this result still hold for positive value of γ.

However, if γ is sufficiently large and Φ is very large, there are cases where the quasi-linear utility function produces corner solutions: the autocrat maximizes the production of the public good by choosing a level of bribe rate $b = 0$ so that $x_H^d = 0$ as shown in appendix 9.4. In the decentralized regime, $g_H^d = g_L^d$ and the autocrat has the same utility as the representative agent of the state L. The autocrat by maximizing his utility maximizes also the utility of the agent in the poor state L. The utility of the representative agent of L is therefore the same under autocracy and democracy.[25] The probability of rebellion by the poor region under decentralization falls to 0. It is not the case under centralization as $g_H^c > g_L^c$ and the utility of the agent of region L is smaller than in democracy,

[24] See Corchon and Serena, 2018 for a survey on contest functions.
[25] That is $U_A^d(g_H^d, x_H^d) = \gamma v(g_H^d) = U_L^d(g_L^d, x_L^d) = U^*(g_L^*, x_L^*)$.

$\gamma v(g_L^c) < \gamma v(g_L^*)$, so that the probability of rebellion is strictly positive. In this extreme case, $\delta > 0$ and decentralization hinders the transition to democracy, but it's also a case where the autocracy is extremely stable, as the poor region has zero interest in rebelling if the autocrat implement decentralization. This limit case of a pure public good economy, without any bribes diverted by the autocrat, doesn't really fit into our unstable autocracy framework.

To exclude this possibility, we assume in what follows that $\Phi = 2$. Even when $\gamma = 1$, this assumption guarantees that we have interior solutions in our parametric example in autocracy (see appendix 9.4). To make the analysis interesting, we start from a situation where the citizens of region H prefer the status quo of a centralized autocracy to a centralized democracy.[26]

Assumption 3.
$$\frac{kEa}{1+Ea} < \frac{\left(E(a^2)\right)^2}{k^2 + E(a^2)}$$

We show in Appendix 9.10 that Assumption 3 is stronger than condition (13) in Proposition 2 for all $k \geq 1$. It implies that under a stable autocracy the autocrat prefers centralization to decentralization, too. We show the next proposition.

Proposition 5. *Let $\Phi = 2$, $N \to +\infty$, $a_L = 1$, $a_H = k \geq \frac{1}{n_H}$ and let Assumption 3 holds. If the autocrat shares equally his rents between his followers of region H, there is a threshold, $\tilde{K} > 0$, such that if $K \geq \tilde{K}$, he will choose to decentralize before initiating a peaceful transition to democracy. Otherwise, the autocrat will be a hardliner and will maintain a centralized autocratic system at all cost, including civil war.*

Proof. See appendix 9.11 □

Taking into account the strategic effects of decentralization reforms, we show that, in our base case model, they accelerate the democratic transition. By increasing the autonomy and productivity

[26] Normalizing $a_L = 1$ so that $a_H = k > 1$ and focusing on large populations, i.e. $N \to +\infty$, we show in Appendix 9.10 that under Assumption 3, $U_H^{c*} < U_H^c$ for all $s \leq n_L \in [\frac{1}{N_H}, 1]$, so that the autocrat can always enlist the support of the rich region in the fight against a rebellion from the poor region.

of the poor region, decentralization positively affects the probability of a successful rebellion. In addition, it makes democracy more attractive to the citizens of the rich region, because, by virtue of the Proposition 4, they are better off with decentralization in a democratic regime. In context of political instability, they will tend to withdraw their support for the autocrat in the event of decentralization. Proposition 5 therefore shows that in times of political instability, an autocrat chooses to decentralize only when he plans to leave power peacefully and organize the transition to democracy. On the other hand, when he intends to remain in power, he maintains the system centralized. These findings is consistent with a recent trend in the political economy literature (see Alesina et al., 2021, Giuliano et al., 2022) showing that autocrats reinforce centralization and promote nation-building by implementing policies such as the imposition of a national language, universal schooling or universal military conscription, in order to reduce the threat of being overthrown by democratization reforms.

From a policy perspective, a greedy autocrat who diverts huge bribes by siphoning part of the total country production will cling to power and will not decentralize, even if this leads to civil war. Now, if the autocrat run a patronage economies and redistributes so that $s = \frac{1}{N_H}$, decentralization and a peaceful transition to democracy will occur if K, the difference in penalty between a violent and a peaceful transition, is large enough. Proposition 5 hence reveals the importance of the punishment endured by the autocrat when he voluntarily leaves power, compared with the punishment in the event of a violent transition to democracy. When he anticipates the same punishment during a transition to democracy (e.g. being executed after democratization), whether the transition is peaceful or violent so that $K = 0$, he will cling to power through a centralized system, since decentralization would trigger democratization and his demise. By contrast, if the sanctions are sufficiently differentiated based on how the transition occurs, then sanctions can become a useful tool to favor a peaceful transition to democracy. This could for instance be the case if there is no sanction when the autocrat steps down

voluntarily, and K is very large when he clings to power. This underlines the importance of providing guarantees to the autocrat that he will not be persecuted if he agrees to leave power peacefully and organize the democratic transition (by offering him asylum in a country without an extradition treaty, for example).

7 Empirical evidences

One important implication of our theory is that autocratic rulers facing democratic pressures either internally, which is arguably endogenous, or from neighboring countries, which is more exogenous from an identification point of view, may feel compelled to implement fiscal decentralization, i.e., to grant higher subnational fiscal autonomy. We aim to assess the empirical relevance of this result, which as far as we know is new in the literature.

7.1 Data

The analysis draws on a panel dataset combining fiscal data from the International Monetary Fund (IMF), democracy data from the Polity VI project and information on political instabilities and conflict from the Center for Systemic Peace (CSP). The database covers the period 1980-2012, during which many countries underwent a transition to democracy while extensive decentralization reforms took place worldwide. Appendix 10.1 presents a full description of the data used, links to the data sources, the list of countries included in our study, as well as the summary statistics of the variables (Table 3).

Defining non-democratic regimes: The *polity* index of the Polity IV project, which ranges between -10 and 10, evaluates democracy levels across countries. The project defined a country as democratic if it has a *polity* score of at least 6. The scope of this paper being to study non-democratic regimes, the dataset contains the set of the 36 countries, which all experienced a *polity* score below 6

at least once between 1980 and 2012.

Measuring fiscal decentralization: We look at two different IMF's measures of fiscal centralization levels:[27]

- *Transfer Dependency* index, which represents the extent to which a local government relies on net transfer from other levels of government, relative to its own revenue. It captures the country's level of fiscal centralization, since an increase in the index means that sub-national governments rely more on central transfers as a source of revenue, i.e., they are less tax-autonomous.

- *Tax Revenue Decentralization* index, which represents the share of own tax revenues generated by a local government as a proportion of the general government tax revenue (whereby transfers from other government units, foreign governments and international organizations are excluded from localities' own revenue). It provides a measure of fiscal decentralization, as the index increases with the degree of fiscal autonomy at the sub-national level.

An increase in *Tax Revenue Decentralization* and a decrease in *Transfer Dependency* both signal a higher fiscal decentralization. However, both indicators might also move in the same direction, as they are not mutually exclusive. We analyze them in parallel to account for the complexity of the tax environment.

Measuring political instability: Variables from the CSP database provide information on instabilities and democratic pressure faced by a country, hence proxying for events that could signal a forthcoming change of regime. We rely on two (lagged) variables:

- *Domestic Instability*, which accounts for the presence and magnitude of major societal events, including civil violence, ethnic violence and war, in a country on a given year.

[27] One challenge we faced was to find accurate and reliable measures of tax system. Such issues have been analyzed by Stegarescu (2005), who exposed the problems encountered in defining and measuring the degree of fiscal decentralization. Martinez-Vazquez and Timofeev (2010) reviewed different approaches to measure decentralization, through expenditure ratios, revenue ratios and composite ratio measures. Our two fiscal decentralization variables come from the IMF's Fiscal Decentralization Database, a dataset commonly used to assess the contribution of sub-national governments to both the revenue and expenditure functions of the general government (see e.g., Altunbaş and Thornton, 2012).

- *Foreign Instability*, which provides a measure of societal (ethnic and civic) major episodes of political violence and conflict events present in neighboring states, and in countries of general proximity.

Additional controls: The analysis also controls for the GDP per capita, population size and real effective exchange rates from the *World Development Indicators* dataset (World Bank), as well as the ethnic fragmentation index from the *Historical Index of Ethnic Fractionalisation (HIEF)* dataset of the European University Institute. The objective of these control variables is to capture the size and relative economic openness of each country, as well as the population heterogeneity, as these dimensions are likely to influence the regime's decentralization decision. Indeed, Wallis and Oates (1988) found that variables such as income, demographic variables or heterogeneity of preferences among the population influenced the decentralization process. Irrespective of any other considerations, we therefore expect countries with more heterogeneous populations (in terms of language, religion, etc.) to be more decentralized, as this structure allows to focus on smaller, more homogeneous groups. The ethnic fragmentation index, which measures the probability that two randomly drawn individuals are not from the same ethnic group, is therefore included in all our regressions to control for population heterogeneity. This index is better suited to our study than other measures of population heterogeneity, such as the Gini coefficient. Indeed, as shown by our theory, inequality between regions is endogenous (i.e., it depends on the decentralization decision), while cultural traits are not.[28]

7.2 Link between political instability and decentralization

For any given country i and period t, the following regression evaluates the correlation between the fiscal autonomy and the democratic pressure observed in the past two years.

$$Y_{i,t} = \beta_0 + \beta_1 E_1(Polity)_{i,t} + \beta_2 E_1(Domestic)_{i,t} + \beta_3 E_1(Foreign)_{i,t} + \beta_4 X_{i,t} + \alpha_i + \mu_t + u^Y_{i,t} \quad (18)$$

[28] We are grateful to an anonymous referee for prompting this discussion.

At period t, the regime of country i implements a level of $Transfer\ Dependency$, denoted as $Y_{i,t}$, the dependent variable. For completeness sake, an alternative regression looks at $Tax\ Decentralization$ ratio. To proxy for a robust and persistent political pressure, the main independent variables represent the average of each political index between the current period t and the past period $t-1$. That is, for each variable $w = \{Polity, Domestic\ Instability, Foreign\ Instability\}$ one gets $E_1(w)_{i,t} = \big(w_{i,t} + w_{i,t-1}\big)/2$. The regression also includes a set of controls $X_{i,t}$ for a given country i at year t, containing ethnic fragmentation, GDP per capita, exchange rate, as well as population size. Moreover, the analysis accounts for the country's invariant characteristics through the fixed effects α_i. Indeed, fiscal decisions are context-specific and are likely to be affected by instability-related events that deviate from the mean, i.e., unusual events. Finally, the regression also controls for yearly fixed effects μ_t, to proxy for any common time trend across countries. Results are displayed in Table 2.

Table 2: Correlation between fiscal autonomy and political instability

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency			Tax decentralization		
$E_1(Polity)$	0.202***	0.136**	0.145***	0.00482**	0.00672***	0.00638***
	(0.0543)	(0.0546)	(0.0545)	(0.00199)	(0.00200)	(0.00201)
$E_1(Domestic)$		-0.536***	-0.553***		0.0213***	0.0209***
		(0.128)	(0.128)		(0.00528)	(0.00528)
$E_1(Foreign)$			-0.126*			0.00407
			(0.0709)			(0.00272)
Constant	-10.68***	-7.874**	-8.428**	-0.335***	-0.411***	-0.422***
	(3.514)	(3.449)	(3.445)	(0.114)	(0.113)	(0.113)
Observations	259	259	259	353	353	353
R-squared	0.886	0.895	0.897	0.830	0.839	0.841

Note: t statistics in parentheses, * $p<0.1$, ** $p<0.05$, *** $p<0.01$. All regressions include country and year fixed effects, and control for ethnic fragmentation, GDP per capital, population in country, and exchange rate.

Columns (1) and (4) of Table 2 display the correlation between the current decentralization and the average democracy levels across the past two years. Columns (2) and (5) also account for the role of domestic instability in the country over the past two years. Looking at the first coefficients in each row, one sees a positive correlation between the average polity score of past two years and

both dependent variables. That is, countries with higher democracy levels in the past years tend to experience both higher transfer dependency (a sign of centralization) and tax revenue decentralization index (a sign of decentralization). While the increase in transfer dependency could suggest a higher fiscal centralization level, it is nuanced by the increase in local tax autonomy. In other words, in more democratic countries regions are more tax-autonomous, while simultaneously benefiting from a larger redistribution from the central government through transfers. The positive correlation between tax decentralization and democracy is a well established fact acknowledged by many scholars (see for instance, Martinez-Vazquez et al., 1997).

More importantly for our analysis, results in the second row in Table 2 indicate that a larger than usual domestic instability over the past two years is associated with both a lower transfer dependency and higher tax revenue decentralization. In other words, countries facing larger political instabilities in the past are more likely to implement fiscal decentralization by empowering localities. Sub-national levels become more tax autonomous, and rely less on transfers from the central government.

Column (3) of Table 2 confirms that political instability in neighboring countries is associated with lower transfers dependency at the sub national levels. That is, even after controlling for domestic instability, democratic pressure from political instability in neighboring countries may push for greater fiscal decentralization in the home country. Additional robustness checks in the Appendix 10.2, where we apply a z-score methodology to obtain standardized units and meaningful comparison across variables and across countries, confirm these findings: As can be seen in Table 4, the coefficients increase in significance when using standardized units for the independent variables. In the theory developed in section 2, we proposed a causal explanation for these correlations.

Second, since fiscal decentralization reforms may take time to be implemented, we explore Appendix 10.3 the robustness of our results to the inclusion of additional time lags in the main independent variables, both for the main regressions (in levels) and with z-scores and show that the

main results hold when we control for political pressure over a longer period (Tables 5 to 8). Finally, Appendix 10.4 shows that previous results are robust to the exclusion of current levels of democracy and instability. In other words, and in line with our theoretical results, our regressions show that an increase in political instability in non-democratic countries is followed by an increase in the level of decentralization.

8 Conclusion

The paper examines the conditions under which it is rational for an autocrat to initiate decentralization reforms, which can be optimal decisions both when the regime is stable or threatened by democratization. The ruler is faced with a trade-off between rent extraction, which is enhanced by centralization, and productive efficiency, which is maximized by decentralization. In stable autocracies, there are cases where the latter effect dominates. When the inefficiencies generated by a centralized system are substantially high, they limit the country's wealth and, by the same token, the autocrats' ability to extract revenue. This is typically the case when the rich region is small compared to the poor one. Decentralization is implemented to boost productivity in the poorer region and thus maximize the surplus for the autocrat and his clique. On the other hand, when the inefficiency cost of centralization is relatively low, for example because the regions are relatively similar and the productivity gap between them is not too wide, or because the poor region is negligible in size, the autocrat favors centralization.

In unstable autocracies, decentralization is even more likely to be implemented, provided the autocrat is not afraid of being punished too harshly at the time of democratic transition. Indeed, if the median voter, who lives in the poor region, is entrusted with power through democratization reforms, she will have no interest in implementing decentralization reforms, as they will bring her nothing. This contrasts with the situation of the representative agent of the rich region, who has much to lose by

living under a centralized democratic regime. Instability and the prospect of democratization therefore favor decentralization, which is confirmed by our empirical analysis. Excluding pure democracies from our sample, we find that domestic social unrest, and to a lesser extent foreign social unrest, tend to lower national transfer dependency and to increase local tax revenue, two standard measures of decentralization. These findings are robust to various measures, addition of time lag and controls. They suggest that democratization pressure and instability in autocracies tend to favor decentralization.

Finally, taking into account the strategic effects of decentralization reforms we show that, in our context, they tend to accelerate the democratic transition. By increasing the autonomy and productivity of the poor region, decentralization positively affects the probability of a successful rebellion. In addition, it makes democracy more attractive to the citizens of the rich region, who in many cases will withdraw their support for the autocrat. Our research therefore indicates that in a politically unstable context, an autocrat seeking to retain power will consolidate centralization. This result is consistent with recent developments in the political economy literature (see, Alesina et al., 2021, Giuliano et al., 2022), which suggest that autocrats can encourage nation-building and diminish prospects for democratization by enacting policies that reinforce centralization, such as the imposition of a national language, universal education or compulsory military service.

To be able to solve the model and produce intelligible results, our analysis is based on a number of simplifying assumptions. In particular, we have focused on two homogeneous regions (i.e., with one representative agent in each), which makes decentralization very efficient. This assumption may be reasonable in the case of regions composed of relatively homogeneous populations but is not very realistic in other cases. To go further, one could also investigate the different types of decentralization as a rationale for strategic reforms implementation. De-concentration, delegation and devolution exhibit different levels of decision-making and autonomy for locallities. Hence, some forms of decentralization might allow the central state to maintain control over the regions, and could then be strategically

advantageous for autocracies, as advocated by Parry (1997), Keller (2002) or Chanie (2007). We leave these interesting topics for further research.

References

Ahmad, J. et al. (2005). *Decentralization and service delivery*, volume 3603. World Bank Publications.

Alesina, A., Giuliano, P., and Reich, B. (2021). Nation-building and education. *The Economic Journal*, 131(638):2273–2303.

Altunbaş, Y. and Thornton, J. (2012). Fiscal decentralization and governance. *Public Finance Review*, 40(1):66–85.

Arzaghi, M. and Henderson, J. V. (2005). Why countries are fiscally decentralizing. *Journal of Public Economics*, 89(7):1157–1189.

Arze del Granado, F. J., Martinez-Vazquez, J., and McNab, R. M. (2012). Decentralized governance and preferences for public goods. *MPRA paper 42459*.

Bardhan, P. (2002). Decentralization of governance and development. *The Journal of Economic Perspectives*, 16(4):185–205.

Bardhan, P. K. and Mookherjee, D. (2006). *Decentralization and Local Governance in Developing Countries: A Comparative Perspective*, volume 1. The MIT Press, 1 edition.

Besley, T. and Coate, S. (2003). Centralized versus decentralized provision of local public goods: a political economy approach. *Journal of public economics*, 87(12):2611–2637.

Bird, R. M. and Vaillancourt, F. (2008). *Fiscal decentralization in developing countries*. Cambridge University Press.

Canavire-Bacarreza, G., Martinez-Vazquez, J., and Yedgenov, B. (2020). Identifying and disentangling the impact of fiscal decentralization on economic growth. *World Development*, 127:104742.

Chanie, P. (2007). Clientelism and ethiopia's post-1991 decentralisation. *The Journal of Modern African Studies*, 45(3):355–384.

Cheema, A., Asim, I. K., and Adnan, Q. (2006). *Local Government Reform in Pakistan: Context, Content and Causes*. in "Decentralization and Local Governance in Developing Countries: A Comparative Perspective", The MIT Press.

Corchon, Diaz, L. C. and Serena, M. (2018). Contest theory: A survey. *Handbook of Game Theory and Industrial Organization*.

Ding, Y., McQuoid, A., and Karayalcin, C. (2019). Fiscal decentralization, fiscal reform, and economic growth in china. *China Economic Review*, 53:152–167.

Dziobek, C., Gutierrez Mangas, C. A., and Kufa, P. (2011). Measuring fiscal decentralization-exploring the imf's databases. *IMF Working Paper, WP/11/126*.

Eaton, K. (2001). Decentralisation, democratisation and liberalisation: the history of revenue sharing in argentina, 1934–1999. *Journal of Latin American Studies*, 33(1):1–28.

Foster, A. D. and Rosenzweig, M. R. (2002). Democratization, decentralization and the distribution of local public goods in a poor rural economy. *PIER Working Paper No. 01-056*.

Genicot, G., Bouton, L., and Castanheira, M. (2021). Electoral Systems and Inequalities in Government Interventions. *Journal of the European Economic Association*, 19(6):3154–3206.

Giuliano, P., Reich, B., and Riboni, A. (2022). What motivates leaders to invest in nation-building? Technical report, National Bureau of Economic Research.

Gomez-Reino, J. L. and Martinez-Vazquez, J. (2013). An international perspective on the determinants of local government fragmentation. *Georgia State Univ., Andrew Young School of Policy Studies*.

Grindle, M. (2007). *Going Local: Decentralization, Democratization and the Promise of Good Governance*. Princeton University Press.

Guirkinger, C. and Platteau, J.-P. (2015). Transformation of the family farm under rising land pressure: A theoretical essay. *Journal of Comparative Economics*, 43(1):112–137.

Guirkinger, C., Platteau, J.-P., and Goetghebuer, T. (2015). Productive inefficiency in extended agricultural households: Evidence from mali. *Journal of Development Economics*, 116:17–27.

Keller, E. J. (2002). Ethnic federalism, fiscal reform, development and democracy in ethiopia. *African Journal of Political Science*, 7(1):21–50.

Knack, S. and Keefer, P. (1997). Does inequality harm growth only in democracies? a replication and extension. *American Journal of Political Science*, 41(1):323–332.

Kosec, K. and Mogues, T. (2020). Decentralization without democracy. *World Politics*, 72(2):165–213.

Lin, J. Y. and Liu, Z. (2000). Fiscal decentralization and economic growth in china. *Economic development and cultural change*, 49(1):1–21.

Martinez-Vazquez, J., McNab, R., et al. (1997). Fiscal decentralization, economic growth, and democratic governance. In *USAID Conference on Economic Growth and Democratic Governance, Washington, DC, October*, pages 9–10.

Martinez-Vazquez, J. and Timofeev, A. (2010). Decentralization measures revisited. *Public Finance and Management*, 10(1):13.

Oates, W. E. (1972). Fiscal federalism. *New York: Harcourt Brace Jovanovich*.

Oates, W. E. (1993). Fiscal decentralization and economic development. *National tax journal*, 46(2):237–243.

OCDE (2019). *Making Decentralisation Work*.

Ostrom, E., Schroeder, L., Wynne, S., et al. (1993). *Institutional incentives and sustainable development: infrastructure policies in perspective*. Westview Press.

O'Neill, K. (2004). Decentralization in bolivia: Electoral incentives and outcomes. *Decentralization and Democracy in Latin America*, pages 35–66.

Panizza, U. (1999). On the determinants of fiscal centralization: Theory and evidence. *Journal of public economics*, 74(1):97–139.

Parry, T. R. (1997). Achieving balance in decentralization: A case study of education decentralization in chile. *World Development*, 25(2):211–225.

Persson, T. and Tabellini, G. (1996a). Federal fiscal constitutions: Risk sharing and moral hazard. *Econometrica: Journal of the Econometric Society*, pages 623–646.

Persson, T. and Tabellini, G. (1996b). Federal fiscal constitutions: risk sharing and redistribution. *Journal of political Economy*, 104(5):979–1009.

Phan, D. H. B., Iyke, B. N., Sharma, S. S., and Affandi, Y. (2021). Economic policy uncertainty and financial stability–is there a relation? *Economic Modelling*, 94:1018–1029.

Ranis, G. and Stewart, F. (1994). Decentralisation in indonesia. *Bulletin of Indonesian Economic Studies*, 30(3):41–72.

Reynès, F. (2019). The cobb–douglas function as a flexible function: A new perspective on homogeneous functions through the lens of output elasticities. *Mathematical Social Sciences*, 97:11–17.

Seabright, P. (1996). Accountability and decentralisation in government: An incomplete contracts model. *European economic review*, 40(1):61–89.

Sepulveda, C. F. and Martinez-Vazquez, J. (2011). The consequences of fiscal decentralization on poverty and income equality. *Environment and Planning C: Government and Policy*, 29(2):321–343.

Stegarescu, D. (2005). Public sector decentralisation: measurement concepts and recent international trends. *Fiscal studies*, 26(3):301–333.

Tiebout, C. M. (1956). A pure theory of local expenditures. *Journal of political economy*, 64(5):416–424.

Treisman, D. (2002). Decentralization and the quality of government. *unpublished paper, Department of Political Science, UCLA*.

Van der Wal, A. (2007). Decentralization of education in chile. *Education International*.

Wallis, J. J. and Oates, W. E. (1988). *Decentralization in the Public Sector: An Empirical Study of State and Local Government*, pages 5–32. in Fiscal Federalism: Quantitative Studies at University of Chicago Press.

World Bank, A. (1998). *World Development Report 1999/2000*. The World Bank.

Xu, C. (2011). The fundamental institutions of china's reforms and development. *Journal of Economic Literature*, 49(4):1076–1151.

Zhuravskaya, E. V. (2000). Incentives to provide local public goods: fiscal federalism, russian style. *Journal of Public Economics*, 76(3):337–368.

9 Appendix

9.1 Micro-foundation for the production function (2)

Let $Y_r = F(A_r, N_r, G_r)$ be the production function where A_r is the capital, N_r the labor, and G_r the public good available in region $r = L, H$. Since we are focusing on constant returns to scale sectors, the production function F, strictly increasing and concave in its arguments, is homogeneous of degree 1. Reynès (2019) shows that all production functions satisfying these assumptions are generalized Cobb-Douglas functions (i.e., possibly with variable production's inputs-elasticity) and if the inputs elasticities of the production functions are constant then they are standard Cobb-Douglas functions. To keep the exposition simple and derive closed form solution, we further assume that the input elasticities of production F are constant so that, without loss of generality, $F(A, N, G) \equiv A^{\alpha} G^{\phi} N^{\eta}$, with $\alpha + \phi + \eta = 1$. By assumption, region H is richer and more productive than region L (i.e., it is the region endowed with the largest stock of capital): $A_H > A_L \geq 1$. Let $a_r = \left(\frac{A_r}{N_r}\right)^{\alpha}$. Since $A_H > A_L \geq 1$ and $1 < N_H < N_L$ we have $1 \leq a_L < a_H$. We deduce assumption (2). Let g_r be the per capita level of public good in region $r = H, L$: $G_r = N_r g_r$. We deduce that $y_r = \frac{Y_r}{N_r} = a_r (g_r)^{\phi}$ with $\phi \in (0, 1)$. QED

9.2 Proof of Proposition 1

9.2.1 Decentralization

First, when the autocrat in region H has the power, in the decentralized case, each region adapts freely its level of local investment in the public good. That is, $q_H = (1-b)\tau_H y_H$, and $q_L = (1-b)\tau_L y_L$ perfectly complement $Q = (1-b)ty$. The autocrat chooses t such that $ty = \tau_H y_H$, therefore the public good available in region H is $g_H = (1-b)ty$ and $y_H = a_H\big((1-b)ty\big)^{\phi}$. Similarly region L chooses $\tau_L = t\frac{y}{y_L}$ so that $g_L = (1-b)ty$ and $y_L = a_L\big((1-b)ty\big)^{\phi}$. We deduce that, when power over local public goods is decentralized in autocracy then $\frac{y_H}{y_L} = \frac{a_H}{a_L}$.

Second, in democracy, when the power to fix t is in region L, the government chooses t such that $ty = \tau_L y_L$, therefore $g_L = ty$ and $y_L = a_L(ty)^\phi$ and region H implements $\tau_H = t\frac{y}{y_H} < \tau_L$ so that $y_H = a_H(ty)^\phi$. It implies that $\frac{y_H}{y_L} = \frac{a_H}{a_L}$. We deduce that, whether the regime is democratic or autocratic, when power over local public goods is decentralized then $\frac{y_H}{y_L} = \frac{a_H}{a_L}$.

In case of decentralization, we therefore have that $y = n_H y_H + n_L y_L = \left(n_H \frac{a_H}{a_L} + n_L\right) y_L = \frac{Ea}{a_L} y_L = \frac{Ea}{a_H} y_H$. We deduce that

$$y_L = \frac{a_L}{Ea} y \qquad \text{and} \qquad y_H = \frac{a_H}{Ea} y \tag{19}$$

9.2.2 Centralization

In the centralized case the private sector is taxed uniformly throughout the country. First, when the autocrat in region H has the power, he sets $q_H = (1-b)\tau y_H = (1-b)ty = Q$, leading to $\tau = \frac{ty}{y_H}$, so that $g_H = (1-b)yt$ and $y_H = a_H\left((1-b)ty\right)^\phi$. By virtue of the property of the minimum function $y_L = a_L\left((1-b)min\{ty, \tau y_L\}\right)^\phi \leq a_L\left((1-b)ty\right)^\phi < y_H = a_H\left((1-b)ty\right)^\phi$ since $a_H > a_L$. As $y_H > y_L$ and $1 = n_H + n_L$, one gets $y_L < y < y_H$. This implies that the per-capita level of public good available to a resident of region L is strictly smaller than the level available to a resident of region H: $g_L = min\{Q, q_L\} = (1-b)min\{ty, \tau y_L\} = ty(1-b)min\{1, \frac{y_L}{y_H}\} = \frac{y_L}{y_H} ty(1-b) < g_H = ty(1-b)$. We deduce that the per-capita production level in the two regions is $y_H = a_H\left((1-b)ty\right)^\phi$ and $y_L = a_L\left(\frac{y_L}{y_H}(1-b)ty\right)^\phi$ so that $\frac{y_H}{y_L} = \left(\frac{a_H}{a_L}\right)^{\frac{1}{1-\phi}}$.

Second, when the power is centralized and democratic, it lies in L. Then $ty = \tau y_L$ so that the investment in the local public good in region L, $q_L = \tau y_L$, perfectly complements the investment in the national component of the public good $Q = ty$. This implies for region H that the national investment in the public good is insufficient compared to the investment at the local level: $q_H = \frac{ty}{y_L} y_H > Q = ty$.

We deduce that $g_L = g_H = ty$ and that $y_r = a_r\left(ty\right)^\phi$ for $r = H, L$ so that $\frac{y_H}{y_L} = \frac{a_H}{a_L}$. Therefore, equation (19) also holds under centralization. Since by Assumption 2 we have $\frac{a_H}{a_L} \geq 1$ and since

$\phi < 1$, comparing (4) and (5) yields $\frac{a_H}{a_L} < \left(\frac{a_H}{a_L}\right)^{\frac{1}{1-\phi}}$. Therefore the productivity gap between the two regions is higher when power lies in the rich region H than in the poor region L, whether the regime is democratic or autocratic. QED

9.3 Proof of Lemma 1

In the case of centralization, the total tax revenue collected is $T^c = (t+\tau)Y = (t+\tau)Ny$. The autocrat keeps for himself and his clique bT^c. The rest, $(1-b)T^c$, is used to finance the public goods so that the per capita provision of national and local public goods are $Q = (1-b)ty$ and $q_r = (1-b)\tau y_r$, with $r = H, L$. By construction, the budget is balanced: $n_H q_H + n_L q_L + Q = (1-b)(t+\tau)y$.

Let $\Phi = \frac{1}{1-\phi} > 1$ and $\Phi - 1 = \frac{\phi}{1-\phi} > 0$ since $\phi \in (0,1)$. Let $E(a^\Phi) = n_H(a_h)^\Phi + n_L(a_L)^\Phi$. As shown in section 9.2.2 The autocrat chooses $\tau = t\frac{y}{y_H}$ so that $g_H = \min\{q_H, Q\} = (1-b)ty$. Equation (4) implies that $y = y_H(n_H + n_L\left(\frac{a_L}{a_H}\right)^\Phi) = y_H\frac{E(a^\Phi)}{a_H^\Phi}$. Substituting in this expression $y_H = a_H\left((1-b)ty\right)^\phi$ from (2), returns after resolution and simplification $y = \left(\frac{E(a^\Phi)}{(a_H)^{\Phi-1}}\right)^\Phi \left((1-b)t\right)^{\Phi-1}$.

Considering the general case where $\gamma \geq 0$ the autocrat chooses b and t so as to maximize the utility function defined in (1) where his private consumption is $x_A^c = sbT^c = sbNy(t+\tau) = sbNy(t+\frac{ty}{y_H}) = sbNyt\ \frac{a_H^\Phi + E(a^\Phi)}{a_H^\Phi}$ and where the level of public good available in his region H is $g_H = \min\{q_H, Q\} = \left((1-b)t\frac{E(a^\Phi)}{(a_H)^{\Phi-1}}\right)^\Phi$. The autocrat solves :

$$\max_{t,b} U_A^c = \gamma v\left(\left((1-b)t\frac{E(a^\Phi)}{(a_H)^{\Phi-1}}\right)^\Phi\right) + sNb(1-b)^{\Phi-1}t^\Phi\frac{a_H^\Phi + E(a^\Phi)}{a_H^\Phi}\left(\frac{E(a^\Phi)}{a_H^{\Phi-1}}\right)^\Phi \tag{20}$$

under the constraint that $1 - t - \tau = 1 - t\left(\frac{a_H^\Phi + E(a^\Phi)}{a_H^\Phi}\right) \geq 0$ and $0 \leq b \leq 1$. It is easy to check that under the assumption that $v'(g) > 0$, whatever the bribe rate $b \in [0,1]$, the autocrat utility function is strictly increasing in t. Therefore the autocrats chooses the maximum tax level that satisfies the tax budget constraint: $t^c = 1 - \tau^c = \frac{a_H^\Phi}{a_H^\Phi + E(a^\Phi)}$, which yields equation (7). This optimal value is independent of the specific shape of $v(g)$. Substituting t^c by its value from (7) in the autocrat utility

function (20) yields after simplification

$$\max_b U_A^c = \gamma v\left(g_H\right) + sNb(1-b)^{\Phi-1}\left(\frac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^{\Phi-1} E(a^\Phi) \tag{21}$$

where $g_H = \left(\frac{(1-b)a_H E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^\Phi$. Optimizing (21) with respect to b yields:

$$\frac{\partial U_A^c}{\partial b} = -\gamma\Phi(1-b)^{\Phi-1}\left(\frac{a_H E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^\Phi v'\left(g_H\right) + \frac{sN\left(E(a^\Phi)\right)^\Phi}{\left(a_H^\Phi + E(a^\Phi)\right)^{\Phi-1}}\left(1-\Phi b\right)(1-b)^{\Phi-2} = 0$$

The optimal embezzlement rate for the autocrat in a centralized regime is then solution to:

$$b^c = \frac{1}{\Phi}\max\left\{1 - \gamma\frac{a_H^\Phi(1-b^c)v'(g_H)\Phi}{sN\left(a_H + E(a^\Phi)\right)},\ 0\right\} \in \left(0, \frac{1}{\Phi}\right) \tag{22}$$

9.3.1 The base case $\gamma = 0$

Plugging $\gamma = 0$ in equation (22) yields equation (8): $b^c = \frac{1}{\Phi}$. We deduce that, when $\gamma = 0$, the autocrat's utility under the centralized regime, which is concave for all $b \leq \frac{2}{\Phi}$, is maximum at:

$$U_A^c = sN\left(\frac{\Phi-1}{\Phi}\right)^{\Phi-1}\left(\frac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^{\Phi-1}\frac{E(a^\Phi)}{\Phi}. \tag{23}$$

The utility of a representative agent of region H who gets a fraction $\frac{1-s}{N_H-1}$ from the bribes diverted by the autocrat is $U_H^c = \frac{1-s}{N_H-1}b^cT^c$:

$$U_H^c = (1-s)\frac{N}{N_H-1}\left(\frac{\Phi-1}{\Phi}\right)^{\Phi-1}\left(\frac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^{\Phi-1}\frac{E(a^\Phi)}{\Phi}. \tag{24}$$

Finally, given that the private consumption of agent L is defined by $x_L = y_L(1-t^c-\tau^c) = 0$, the utility of a representative agent of region L is

$$U_L^c = 0 \tag{25}$$

Since $s \in [\frac{1}{N_H}, 1]$ we have that $U_A^c \geq U_H^c > U_L^c$, which concludes the proof of Lemma 1.

For instance when $\phi = \frac{1}{2}$ we have $\Phi = 2$ so that $b^c = \frac{1}{2}$ and $\forall s \in [\frac{1}{N_H}, 1]$

$$U_A^c = \frac{sN}{4} \frac{\left(E(a^2)\right)^2}{a_H^2 + E(a^2)} \geq U_H^c = \frac{(1-s)N}{4(N_H - 1)} \frac{\left(E(a^2)\right)^2}{a_H^2 + E(a^2)} > U_L^c = 0. \tag{26}$$

9.3.2 Robustness check when $\gamma > 0$

Since $v'(g) > 0$ and since $\frac{a_H E(a^\Phi)}{a_H^\Phi + E(a^\Phi)} > 0$, optimizing (21) when $\gamma > 0$ yields equation (22) which returns a lower value of bribe extraction: $b^c < \frac{1}{\Phi}$. As shown in section 9.3.3, the value of b^c can even be set to 0 by the autocrat, when the benefit of consuming the public good is sufficiently large compared to the benefit of consuming the private good. We therefore distinguish two cases:

- When $b^c = 0$ it implies that $U_A^c = U_H^c = \gamma v(g_H) > U_L^c = \gamma v(g_L)$ since $g_H > g_L$.
- When $b^c > 0$ then $U_A^c = \gamma v(g_H) + sb^cT^c \geq U_H^c = \gamma v(g_H) + \frac{1-s}{N_H - 1} b^cT^c > U_L^c = \gamma v(g_L)$ since $g_H > g_L$ and since $s \in [\frac{1}{N_H}, 1]$.

This shows the robustness of Lemma 1 to positive values of γ.

9.3.3 Closed-form solutions with $v(g) = g^\phi$

It is useful to illustrate our general results with the example of the power function, $v(g) = g^\phi$, where $\phi \in (0, 1)$ is chosen for convenience as it simplifies the expressions below. Substituting $v(g) = g^\phi$ in (21) yields:

$$U_A^c = \left(\frac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^{\Phi - 1} (1-b)^{\Phi - 1} \left(\gamma a_H^{\Phi - 1} + bsNE(a^\Phi)\right) \tag{27}$$

The optimal bribe rate for the autocrat in a centralized regime is then

$$b^c = \frac{1}{\Phi} \max\left\{1 - \gamma \frac{(\Phi - 1) a_H^{\Phi - 1}}{sNE(a^\Phi)} \ , \ 0\right\} \ \in \ \left(0, \frac{1}{\Phi}\right) \tag{28}$$

We deduce that $b^c = 0$ if $\frac{sNE(a^\Phi)}{(\Phi-1)a_H^{\Phi-1}} \leq \gamma$. For instance when $\gamma = 1$ and $s = \frac{1}{N_H}$, if $1 + \frac{n_H E(a^\Phi)}{a_H^{\Phi-1}} \leq \Phi$ then $b^c = 0$.[29] In other words, when Φ is large, which means that ϕ is close to 1, the autocrat values the public good enough to choose to maximize its production. This type of corner solution is typical of quasi-linear preferences.[30] It implies that

$$U_A^c = \gamma \left(\frac{a_H E(a^\Phi)}{a_H^\Phi + E(a^\Phi)} \right)^{\Phi-1} = U_H^c > U_L^c \tag{29}$$

Focusing next on interior solution, after substituting $b^c > 0$ from (28), the autocrat's utility under centralization is given by

$$U_A^c = \frac{(\Phi-1)^{\Phi-1}}{\Phi^\Phi} \left(\frac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)} \right)^{\Phi-1} \frac{\left(sNE(a^\Phi) + \gamma a_H^{\Phi-1}\right)^2}{sNE(a^\Phi)}. \tag{30}$$

The utility of a representative agent of region H who gets a fraction $\frac{1-s}{N_H-1}$ from the bribes diverted by the autocrat is $U_H^c = \gamma\sqrt{g_H} + \frac{(1-s)b^c T^c}{N_H-1}$. This yields:

$$U_H^c = \left[\tfrac{\Phi-1}{\Phi}\right]^{\Phi-1} \left[\tfrac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right]^{\Phi-1} \left[1 + \tfrac{\gamma a_H^{\Phi-1}}{sNE}\right]^{\Phi-1} \left(\gamma a_H^{\Phi-1} + \tfrac{1-s}{s\Phi(N_H-1)}\left[sNE(a^\Phi) - \gamma(\Phi-1)a_H^{\Phi-1}\right]\right) \tag{31}$$

The utility of a representative agent of region L, is $U_L^c = \gamma(g_L)^\phi$, or replacing

$$U_L^c = \gamma \left[\frac{\Phi-1}{\Phi}\right]^{\Phi-1} \left(\frac{a_L E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^{\Phi-1} \left(\frac{sNE(a^\Phi) + \gamma a_H^{\Phi-1}}{sNE(a^\Phi)}\right)^{\Phi-1} \tag{32}$$

Closed form solution when $\phi = 0.5$: It implies that $\Phi = 2$. It is easy to check from (28) that $b^c = \frac{1}{2}\left(1 - \gamma\frac{a_H}{sNE(a^2)}\right) > 0$. Indeed b^c is minimal for $\gamma = 1$ and $s = \frac{1}{N_H}$ so that the parenthesis is always positive: $1 > \frac{n_H a_H}{E(a^2)}$. Substituting $b^c = \frac{1}{2}\left(1 - \gamma\frac{a_H}{sNE(a^2)}\right)$ and $\Phi = 2$ in (30), the autocrat's

[29] A sufficient condition for this to happen is that $1 + n_H a_H \leq \Phi$.
[30] Typically it will not hold with a Cobb-Douglas utility function.

utility under centralized regime is given by

$$U_A^c = \frac{(sNE(a^2)+\gamma a_H)^2}{4sN(a_H^2+E(a^2))}. \tag{33}$$

The utility of a representative agent of region H who gets a fraction $\frac{1-s}{N_H-1}$ from the bribes diverted by the autocrat is $U_H^c = \gamma\sqrt{g_H} + \frac{(1-s)b^cT^c}{N_H-1} = (1-b^c)\frac{E(a^2)}{a_H^2+E(a^2)}\Big(\gamma a_H + b^c\frac{(1-s)N}{N_H-1}E(a^2)\Big)$, equivalent to:

$$U_H^c = \frac{sNE(a^2)+\gamma a_H}{2sN(a_H^2+E(a^2))}\Big(\gamma a_H + (1-s)\frac{sNE(a^2)-\gamma a_H}{2s(N_H-1)}\Big) \tag{34}$$

The utility of an agent of region L is

$$U_L^c = \gamma\sqrt{g_L} = \gamma\frac{a_L}{a_H}(1-b^c)t^c\frac{E(a^2)}{a_H} = \frac{\gamma a_H + sNE(a^2)}{2sN(a_H^2+E(a^2))}\gamma a_L. \tag{35}$$

When $0<\gamma\leq 1$, comparing equations (33), (34) and (35), it is straightforward to check, since $s\in[\frac{1}{N_H},1]$, $N_H>1$, $a_H>a_L\geq 1$, that $U_L^c<U_H^c\leq U_A^c$.

Finally when $\gamma=0$, one gets (26) so that: $U_L^c=0\leq U_H^c=\frac{1-s}{s(N_H-1)}U_A^c\leq U_A^c$.

9.4 Proof of Lemma 2

Let $\Phi=\frac{1}{1-\phi}>1$ and $\Phi-1=\frac{\phi}{1-\phi}>0$ since $\phi\in(0,1)$. Let $Ea\equiv n_Ha_H+n_La_L$. Under decentralization equation (5) implies that $y=\frac{Ea}{a_H}y_H$. Substituting $y_H=a_H\big((1-b)ty\big)^\phi$ in this expression we deduce that $y=(Ea)^\Phi\left((1-b)t\right)^{\Phi-1}$. Since under decentralization both regions adapt the local investment in the public good to the national investment we have $Q=q_H=q_L=(1-b)ty$ so that $g_r=\min\{Q,q_r\}=\big((1-b)tEa\big)^\Phi$ for $r=H,L$. To achieve this outcome, region $r=H,L$ sets $\tau_r=\frac{ty}{y_r}$. Under decentralization the total level of taxes is $T^d=tY+\tau_HY_H+\tau_LY_L=Nty+N_H\tau_Hy_H+N_L\tau_Ly_L=ty(N+N_H+N_L)=2Nty$.

Under decentralization the autocrat captures $bT^d=b2Nty$ that he shares between himself (a fraction s) and his followers (a fraction $1-s$). The autocrat chooses b and t so as to maximize the

utility function defined in (1) where his private consumption is $sbT^d = sb2N\left(Ea\right)^{\Phi} t^{\Phi}(1-b)^{\Phi-1}$ and his public good consumption is $g_H = \left((1-b)tEa\right)^{\Phi}$.

$$\max_{t,b} U_A^d \quad = \quad \gamma v\left(\left((1-b)tEa\right)^{\Phi}\right) + 2sN\left(Ea\right)^{\Phi} b(1-b)^{\Phi-1}t^{\Phi} \tag{36}$$

Since $v'(g) > 0$ and since $b \in (0,1)$, equation (36) is strictly increasing in t. The autocrat chooses the maximum tax level that satisfies the tax budget constraint of the regions.

Since $a_L < a_H$, equation (5) guarantees that $\tau_L = t\frac{y}{y_L} = t\frac{Ea}{a_L} > \tau_H = t\frac{y}{y_H} = t\frac{Ea}{a_H}$. The binding constraint for the autocrat is that of the poor region: $0 \leq 1-t-\tau_L = 1-t\left(1+\frac{Ea}{a_L}\right) < 1-t-\tau_H = 1-t\left(1+\frac{Ea}{a_H}\right)$. The autocrat chooses t so that $1-t\left(1+\frac{Ea}{a_L}\right) = 0$, which yields equation (10): $t^d = 1-\tau_L^d = \frac{a_L}{a_L+Ea}$.

With decentralization, the autocrat loses control over local tax levels and spending, which means he loses control over the allocation of a fraction of the surplus from private production. As the poorer region invests relatively more locally than the richer region to compensate for its lower productivity, the national tax is determined by the budget constraint of the poorer region. The autocrat is hence obliged to relinquish rents to the inhabitants of region H. We have that $y_H(1-t^d-\tau_H^d) = y_H\frac{(a_H-a_L)Ea}{a_H(a_L+Ea)} = a_H\left(\frac{(1-b)a_LEa}{a_L+a_H}\right)^{\Phi-1}\frac{(a_H-a_L)Ea}{a_H(a_L+Ea)} > 0$.

Substituting $t^d = \frac{a_L}{a_L+Ea}$ in (36), the autocrat chooses b so as to maximize the utility function

$$\max_{b} U_A^d \quad = \quad \gamma v\left(g_H\right) + 2sN\left(\frac{a_LEa}{a_L+Ea}\right)^{\Phi} b(1-b)^{\Phi-1} \tag{37}$$

where $g_H = \left((1-b)\frac{a_LEa}{a_L+Ea}\right)^{\Phi}$. The optimal bribe rate is given by

$$b^d = \frac{1}{\Phi}\max\left\{1-\gamma\frac{v'(g_H)(1-b^d)\Phi}{2sN},\ 0\right\} \ \in \ (0,\frac{1}{\Phi}) \tag{38}$$

It is easy to check that, under our assumptions, the utility function (37) is strictly concave in the

vicinity of b^d.

9.4.1 The base case $\gamma = 0$

Plugging $\gamma = 0$ in equation (38) yields equation (11): $b^d = \frac{1}{\Phi}$. We deduce that, when $\gamma = 0$, the autocrat's utility under the centralized regime, $U_A^d = sb^dT^d$, which is concave for all $b \leq \frac{2}{\Phi}$, is maximum at:

$$U_A^d = s2N \frac{(\Phi - 1)^{\Phi - 1}}{\Phi^\Phi} \left(\frac{a_L E(a)}{a_L + E(a)} \right)^\Phi . \tag{39}$$

Substituting $b^d = \frac{1}{\Phi}$ in y_H yields $y_H(1 - t^d - \tau_H^d) = \left(\frac{\Phi - 1}{\Phi} \frac{a_L E(a)}{a_L + E(a)} \right)^{\Phi - 1} \frac{(a_H - a_L)Ea}{a_L + Ea} > 0$. This private consumption adds to $\frac{1-s}{N_H - 1} b^d T^d$, the fraction from the bribes diverted by the autocrat that the agent H gets. Adding these two terms, the utility of a representative agent of region H is :

$$U_H^d = \left(\frac{1 - s}{N_H - 1} 2N + \frac{a_H - a_L}{a_L} \Phi \right) \frac{(\Phi - 1)^{\Phi - 1}}{\Phi^\Phi} \left(\frac{a_L E(a)}{a_L + E(a)} \right)^\Phi . \tag{40}$$

We deduce that $U_A^d \geq U_H^d$ if and only if $s2N \geq \frac{1-s}{N_H - 1} 2N + \frac{a_H - a_L}{a_L} \Phi$. This is equivalent to (12). Finally, the utility of a representative agent of region L is

$$U_L^d = 0, \tag{41}$$

since the private consumption of agent L is $x_L = y_L(1 - t^d - \tau_L^d) = 0$, which conclude the proof of Lemma 2.

9.4.2 Robustness check when $\gamma > 0$

Since $v'(g) > 0$ and since $\frac{a_H E(a^\Phi)}{a_H^\Phi + E(a^\Phi)} > 0$, optimizing (37) when $\gamma > 0$ yields equation (38) which returns a lower value of bribe extraction: $b^d < \frac{1}{\Phi}$. As shown in section 9.4.3, the value of b^d can even be set to 0 by the autocrat, when the benefit of consuming the public good is sufficiently large compared to the benefit of consuming the private good. We therefore distinguish two cases:

- When $b^d = 0$ it implies that $U_H^d = \gamma v(g_H) + y_H(1 - t^d - \tau_H^d) > U_A^d = \gamma v(g_H) = U_L^d = \gamma v(g_L)$ since $g_H = g_L$.

- When $b^d > 0$ then $U_A^d = \gamma v(g_H) + sb^dT^d$, $U_H^d = \gamma v(g_H) + \frac{1-s}{N_H - 1} b^dT^d + y_H(1 - t^d - \tau_H^d)$ and $U_L^d = \gamma v(g_H)$ since $g_L = g_H$. We deduce that $U_A^d \geq U_H^d$ if and only if $s2N \geq \frac{1-s}{N_H - 1} 2N + \frac{a_H - a_L}{a_L b^d}$ and that $\min\{U_A^d, U_H^d\} > U_L^d$

This shows the robustness of Lemma 2 to positive values of γ.

9.4.3 Closed-form solutions with $v(g) = g^\phi$

It is useful to illustrate our general results with the example of the power function, $v(g) = g^\phi$, where $\phi \in (0, 1)$ is chosen for convenience as it simplifies the expressions below. Substituting $v(g) = g^\phi$ in equation (38) and simplifying yields:

$$b^d = \frac{1}{\Phi} \max\left\{1 - \gamma \frac{\Phi - 1}{2sN} \frac{a_L + Ea}{a_L Ea},\ 0\right\} \in (0, \frac{1}{\Phi}). \tag{42}$$

We deduce that $b^d = 0$ when $\gamma \geq \frac{2sN}{\Phi - 1} \frac{a_L Ea}{a_L + Ea}$. For instance setting $\gamma = 1$ and $s = \frac{1}{N_H}$ we have that $b^d = 0$ if $\Phi \geq 1 + \frac{2}{n_H} \frac{a_L Ea}{a_L + Ea}$. Substituting $v(g) = g^\phi$ in (37), we have that:

$$U_A^d = \gamma \left((1 - b)\frac{a_L Ea}{a_L + Ea}\right)^{\Phi - 1} + 2sN \left(\frac{a_L Ea}{a_L + Ea}\right)^{\Phi} b(1 - b)^{\Phi - 1} \tag{43}$$

Focusing next on interior solutions in (42) and substituting $b^d > 0$ in (43) and simplifying yields:

$$U_A^d = 2sN \frac{(\Phi - 1)^{\Phi - 1}}{\Phi^\Phi} \left(\frac{a_L Ea}{a_L + Ea} + \frac{\gamma}{2sN}\right)^{\Phi} \tag{44}$$

Since $g_L^d = g_H^d$, we have that $U_L^d = \gamma(g_H^d)^\phi = \gamma\left((1-b^d)\frac{a_L Ea}{a_L+Ea}\right)^{\Phi-1}$. Substituting $1-b^d = \frac{\Phi-1}{\Phi}\left(1+\frac{\gamma}{2sN}\frac{a_L+Ea}{a_L Ea}\right)$ yields:

$$U_L^d = \gamma\left(\frac{\Phi-1}{\Phi}\right)^{\Phi-1}\left(\frac{a_L Ea}{a_L+Ea}+\frac{\gamma}{2sN}\right)^{\Phi-1} \tag{45}$$

Since $U_H^d = \gamma(g_H^d)^\phi + \frac{1-s}{N_H-1}b^d T^d + y_H(1-t^d-\tau_H^d)$, where $y_H(1-t^d-\tau_H^d) = a_H\left(\frac{(1-b)a_L Ea}{a_L+a_H}\right)^{\Phi-1}\frac{(a_H-a_L)Ea}{a_H(a_L+Ea)}$, we have that

$$U_H^d = \left(\frac{(1-b)a_L Ea}{a_L+Ea}\right)^{\Phi-1}\left[\gamma + 2Nb\frac{1-s}{N_H-1}\left(\frac{a_L Ea}{a_L+Ea}\right)+\frac{(a_H-a_L)Ea}{a_L+Ea}\right] \tag{46}$$

Using equation (42), one obtains

$$\begin{aligned} U_H^d = \left[\frac{\Phi-1}{\Phi}\right]^{\Phi-1}\left[\frac{a_L E_a}{a_L+E_a}\right]^{\Phi-1}\left[1+\frac{\gamma}{2sN}\frac{a_L+E_a}{a_L E_a}\right]^{\Phi-1} \\ \left[\gamma+\frac{(a_H-a_L)E_a}{a_L+E_a}+\frac{1-s}{\Phi s(N_H-1)}\left(\frac{2sNa_L E_a}{a_L+E_a}-\gamma(\Phi-1)\right)\right] \end{aligned} \tag{47}$$

Closed form solution when $\phi = 0.5$: It implies that $\Phi = 2$ and that $b^d = \frac{1}{2}\max\left\{1-\gamma\frac{a_L+Ea}{2sNa_L Ea},\ 0\right\} \in (0,\frac{1}{2})$ since under assumptions 1 and 2 we have $1 > \gamma\frac{a_L+Ea}{2sNa_L Ea}$ for all $\gamma \in [0,1]$ and $s \in [\frac{1}{N_H},1]$. We deduce that

$$U_A^d = \frac{sN}{2}\left[\frac{a_L Ea}{a_L+Ea}+\frac{\gamma}{2sN}\right]^2 \tag{48}$$

$$U_L^d = \frac{\gamma}{2}\left[\frac{a_L Ea}{a_L+Ea}+\frac{\gamma}{2sN}\right] \tag{49}$$

$$U_H^d = \frac{1}{2}\left[\frac{a_L Ea}{a_L+Ea}+\frac{\gamma}{2sN}\right]\left[\gamma+\frac{(a_H-a_L)Ea}{a_L+Ea}+\frac{1-s}{2s(N_H-1)}\left(\frac{2sNa_L Ea}{a_L+Ea}-\gamma\right)\right] \tag{50}$$

Comparing equations (49) and (50), it is straightforward to check that $U_L^d \leq U_H^d$, since $a_H \geq a_L$ and $s \in [\frac{1}{N_H},1]$. By contrast, comparing equations (48) and (50), it is not always the case that the utility of the autocrat under decentralization is larger than the utility of the representative agent of

region H. Indeed, when $0 < \gamma \leq 1$, one gets $U_A^d > U_H^d$ if and only if

$$\left(1 - \frac{1-s}{s(N_H - 1)}\right)\left(2sN - \gamma\frac{a_L + Ea}{a_L Ea}\right) \geq 2\frac{a_H - a_L}{a_L} \tag{51}$$

When $s = \frac{1}{N_H}$, the Left Hand Side (LHS) of the inequality is 0 so that equation (51) does not hold. When at the other extreme we have $s = 1$, then equation (51) is true if and only if $N+1 \geq \frac{a_H}{a_L} + \gamma\frac{a_L+Ea}{2a_L Ea}$.

Finally when $\gamma = 0$ one gets $b^d = \frac{1}{2}$ and $U_L^d = 0$, $U_H^d = \frac{1}{2}\left(\frac{(1-s)N}{N_H - 1} + \frac{a_H - a_L}{a_L}\right)\left(\frac{E(a)a_L}{a_L + E(a)}\right)^2$ and $U_A^d = \frac{sN}{2}\left(\frac{E(a)a_L}{a_L+E(a)}\right)^2$. We deduce that $U_A^d \geq U_H^d$ if and only if: $s \geq \frac{1}{N_H}\left(1 + \frac{N_H - 1}{N}\frac{a_H - a_L}{a_L}\right)$.

9.5 Comparison of taxes and bribes in centralized and decentralized autocracies

Comparing equations (7) and (10), we want to show that $t^c \geq t^d$, which is equivalent to $a_H^\Phi(a_L + Ea) \geq a_L(a_H^\Phi + E(a^\Phi))$. Simplifying the equation left and right by $a_H^\Phi a_L$, one gets $a_H^\Phi Ea \geq a_L E(a^\Phi)$. Developing, this is equivalent to $n_H a_H^\Phi(a_H - a_L) + n_L a_L(a_H^\Phi - a_L^\Phi) > 0$ which is always true.

We now turn to the comparison of bribe rates. Comparing equations (8) and (11), we have that $b^c = b^d = \frac{1}{\Phi}$ under the base case $\gamma = 0$. When looking at the case $\gamma > 0$, comparing b^c from (22) and b^d from (38), depending on the function and parameter values, they can be either larger or smaller than one another. To demonstrate this, it is sufficient to turn to the closed-form solutions obtained when $v(g) = g^\phi$. Comparing (28) and (42) in cases where the bribe rates are strictly positive, $b^c \geq b^d$ if and only if:

$$\frac{1}{\Phi}\left(1 - \gamma\frac{\Phi - 1}{sN}\frac{a_H^{\Phi-1}}{E(a^\Phi)}\right) \geq \frac{1}{\Phi}\left(1 - \gamma\frac{\Phi - 1}{sN}\frac{a_L + Ea}{2a_L Ea}\right) \tag{52}$$

This is equivalent to

$$2a_L a_H^{\Phi-1} Ea \leq (a_L + Ea)E(a^\Phi). \tag{53}$$

Recall that $Ea = n_H a_H + n_L a_L$, and that $E(a^\Phi) = n_H a_H^\Phi + n_L a_L^\Phi$. Substituting these values and

rearranging the expression, equation (53) is rewritten as

$$\left(\frac{a_H}{a_L}\right)^{\Phi-1} \leq \frac{a_L + Ea}{2Ea}\left(n_H\left(\frac{a_H}{a_L}\right)^{\Phi} + n_L\right) \tag{54}$$

Since $\frac{a_L+Ea}{Ea} \geq 1$, condition (54) always holds for $\frac{a_H}{a_L} \geq \frac{2}{n_H}$. By contrast, if n_L is large (i.e., close to 1 so that n_H is close to 0), then Ea is close to a_L and condition (54) boils down to $\left(\frac{a_H}{a_L}\right)^{\Phi-1} \leq 1$, which is violated since $a_H \geq a_L$.QED

9.6 Proof of Proposition 2

Comparing (23) and (39) we have that:

$$\begin{aligned} & & U_A^c &\geq U_A^d \\ \Leftrightarrow \quad & sN\left(\frac{\Phi-1}{\Phi}\right)^{\Phi-1}\left(\frac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^{\Phi-1}\frac{E(a^\Phi)}{\Phi} &\geq s2N\frac{(\Phi-1)^{\Phi-1}}{\Phi^\Phi}\left(\frac{a_L E(a)}{a_L + E(a)}\right)^{\Phi} \\ \Leftrightarrow \quad & \left(\frac{E(a^\Phi)}{a_H^\Phi + E(a^\Phi)}\right)^{\Phi-1} E(a^\Phi) &\geq 2\left(\frac{a_L E(a)}{a_L + E(a)}\right)^{\Phi} \end{aligned}$$

which yields inequality (13). For instance when $\Phi = 2$ condition (13) becomes: $\frac{\left[E(a^2)\right]^2}{k^2+E(a^2)} \geq 2\left[\frac{Ea}{1+Ea}\right]^2$. Let $a_H = ka_L$ with $k > 1$, condition (13) can be rewritten:

$$\frac{\left[n_H k^\Phi + n_L\right]^\Phi}{\left[(n_H+1)k^\Phi + n_L\right]^{\Phi-1}} \geq 2\left[\frac{n_H k + n_L}{1 + n_H k + n_L}\right]^\Phi \tag{55}$$

Since $\Phi > 1$, it is easy to check that when $k \to +\infty$ then the LHS in (55) is larger than the RHS. When the poor region productivity is negligible compared to the rich region, the autocrat chooses centralization because it is the regime that allows him to obtain proportionally the most bribes. Symmetrically when $k \to 1$ then the LHS in (55) is equal to the RHS and the autocrat has no interest in decentralizing. Assuming n_H is not too small it is easy to check that (55) still hold when k is close enough of 1 but not equal to it. For instance if $\Phi = 2$ and $k = 1.1$ then (55) holds as long as n_H is

not too small. For instance it is true if $n_H \to 0.5$.

By contrast, when $n_H \to 0$, the LHS in (55) converges to $\left[\frac{1}{k^\Phi+1}\right]^{\Phi-1}$, while the RHS converges to $\left[\frac{1}{2}\right]^{\Phi-1}$. Since $k^\Phi > 1$ we deduce that $\frac{1}{k^\Phi+1} < \frac{1}{2}$ so that (55) is violated. When only the production of the poor region matters, the autocrat chooses decentralization to boost the productivity of region L.

9.6.1 Robustness check when $\gamma > 0$

We aim to show that when $\gamma > 0$ our results are robust. Depending on the value of the function and the parameters, decentralization can sometimes dominate centralization for the autocrat. To show this result, it is sufficient to consider the example $v(g) = g^\phi$ with $\phi = 0.5$ and therefore $\Phi = 2$. We focus on interior solutions $b^c > 0$ and $b^d > 0$, and we compare the autocrat's utility under centralization given by (30) and the autocrat's utility under decentralization given by (44) when $\Phi = 2$:

$$\begin{aligned} U_A^c &\geq U_A^d \\ \Leftrightarrow \quad \frac{\left(sNE(a^2)+\gamma a_H\right)^2}{sN\left(a_H^2+E(a^2)\right)} &\geq 2sN\left(\frac{a_L Ea}{a_L+Ea}+\frac{\gamma}{2sN}\right)^2 \\ \Leftrightarrow \quad \frac{a_H^2}{a_H^2+E(a^2)}\left[sN\frac{E(a^2)}{a_H}+\gamma\right]^2 &\geq \frac{1}{2}\left[2sN\frac{a_L Ea}{a_L+Ea}+\gamma\right]^2 \end{aligned}$$

Let $a_H = ka_L$ with $k > 1$, one obtains the following inequalities:

$$\frac{k^2}{n_L+k^2(1+n_H)}\left[sNa_Lk\left(\frac{n_L}{k^2}+n_H\right)+\gamma\right]^2 \geq \frac{1}{2}\left[2sNa_L\frac{n_L+n_Hk}{1+n_L+kn_H}+\gamma\right]^2 \tag{56}$$

which is equivalent to

$$\left[\frac{\gamma+sNa_Lk\left(n_H+\frac{n_L}{k^2}\right)}{\gamma+2sNa_L\frac{n_L+n_Hk}{1+n_Hk+n_L}}\right]^2 \geq \frac{n_L+k^2(1+n_H)}{2k^2} \tag{57}$$

It is easy to check that when $k \to +\infty$ then the LHS in (57) goes to infinity. It is larger than the RHS, which converges to $\frac{1+n_H}{2}$.

By contrast when $n_H \to 0$, $U_A^c \geq U_A^d$ if and only if $\left[\frac{\gamma+\frac{sNa_L}{k}}{\gamma+sNa_L}\right]^2 \geq \frac{1+k^2}{2k^2}$. This inequality is equivalent to: $\gamma\left[k\sqrt{2}-\sqrt{1+k^2}\right] \geq sNa_L\left[\sqrt{1+k^2}-\sqrt{2}\right]$. The assumption $k > 1$ implies that $\sqrt{1+k^2}-\sqrt{2} > k\sqrt{2}-\sqrt{1+k^2} > 0$. We deduce that equation (57) never holds since $\gamma < sNa_L$. That is, $a_L \geq 1$ and $s \geq \frac{1}{N_H}$ so that $sNa_L \geq \frac{a_L N}{N_H} \to +\infty$ when $n_H = \frac{N_H}{N} \to 0$, while $\gamma \leq 1$. In other words, when n_H is small (57) is violated. This shows the robustness of Proposition 2 to the case where $\gamma > 0$. QED

9.7 Proof of Proposition 3

9.7.1 Centralization: uniform t and τ

In the centralization case the private sector is taxed uniformly throughout the country. When the power lies in L then $ty = \tau y_L$. In other words, the local investment in the public good in region L (defined by $q_L = \tau y_L$) perfectly complements the national investment in the public good (defined by $Q = ty$), so that $g_L = ty$. This implies for region H that the national investment in the public good is insufficient compared to its local investment: $q_H = \frac{ty}{y_L} y_H > Q = ty$ so that $g_H = g_L = ty$.

The median voter in region L chooses t so as to maximize the utility function defined in equation (1), where the private consumption is $x_L = (1-t-\tau)y_L$ and the public good available in region L is $g_L = ty$. She sets $\tau = \frac{ty}{y_L}$. We showed previously that (19) holds under centralization, therefore the median voter sets $\tau = \frac{Ea}{a_L}t$. She maximizes her utility function under the constraint that $1-t-\tau = 1-\frac{a_L+Ea}{a_L}t \geq 0$. It implies that $x_L = \left(1-\frac{a_L+Ea}{a_L}t\right)y_L$. We have that $y_L = a_L g_L^{\phi} = a_L(ty)^{\phi}$. We also have by (19) that $y_L = \frac{a_L}{Ea}y$. We deduce that $a_L(ty)^{\phi} = \frac{a_L}{Ea}y$ so that $y = \left(Eat^{\phi}\right)^{\frac{1}{1-\phi}}$. Substituting this value in the expression of the private and the public good yields: $x_L = (a_L-(a_L+Ea)t)\left(Eat\right)^{\frac{\phi}{1-\phi}}$ and $g_L = (Eat)^{\frac{1}{1-\phi}}$. Let $\Phi = \frac{1}{1-\phi}$ and $\Phi - 1 = \frac{\phi}{1-\phi}$. She maximizes

$$\max_t U_L^{c*} = \gamma v\left((Eat)^{\Phi}\right) + \left(a_L-(a_L+Ea)t\right)\left(Eat\right)^{\Phi-1} \tag{58}$$

Optimizing this function with respect to t yields:

$$t^{c*}(\gamma) = \frac{\Phi - 1}{\Phi} \frac{a_L}{a_L + Ea\left[1 - \gamma v'\left((Eat)^{\Phi}\right)\right]} \tag{59}$$

It is easy to check that $t^{c*}(\gamma)$ increases with γ, an intuitive result. When γ increases the weight puts on the public good by the median voter increases because it has a consumption value, in addition to be an input in the production process of the private good. So larger γ means larger investment in the public good, and therefore larger t. In the base case $\gamma = 0$, equation (59) yields

$$t^{c*} = \frac{\Phi - 1}{\Phi} \frac{a_L}{a_L + Ea}. \tag{60}$$

Substituting this value in the taxation constraint yields $1 - t^{c*} - \tau^{c*} = 1 - \frac{a_L + Ea}{a_L} t^{c*} = 1 - \frac{\Phi - 1}{\Phi} = \frac{1}{\Phi} \in (0, 1)$ so that the utility levels reached by the representative agent of region L is:

$$U_L^{c*} = \frac{(\Phi - 1)^{\Phi - 1}}{\Phi^{\Phi}} \left(\frac{Ea}{a_L + Ea}\right)^{\Phi - 1} a_L^{\Phi} \tag{61}$$

Robustness of the results when $\gamma > 0$: We illustrate how our results change when $\gamma \in [0, 1]$ increases with the help of the function $v(g) = (g)^{\phi}$. Equation (58) implies that $U_L^{c*} = \big(\gamma + a_L - (a_L + Ea)t\big)\big(Eat\big)^{\Phi - 1}$. The utility function is strictly concave in t and the optimal taxation rate t for the median voter in region L in (59) is

$$t^{c*} = \frac{\Phi - 1}{\Phi} \frac{a_L + \gamma}{a_L + Ea} \tag{62}$$

which is increasing in γ. Substituting t^{c*} in the different quantities, we are able to compute the utility levels reached by the representative agent of region L:

$$U_L^{c*} = \frac{(\Phi - 1)^{\Phi - 1}}{\Phi^{\Phi}} \left(\frac{Ea}{a_L + Ea}\right)^{\Phi - 1} (a_L + \gamma)^{\Phi} \tag{63}$$

This solution requires that the taxation scheme respect the budget balance constraint, which imposes that $1-\tau^{c*}-t^{c*}=1-\frac{a_L+Ea}{a_L}t^{c*}\geq 0$. It implies that $t^{c*}\leq \frac{a_L}{a_L+Ea}$. So we have a corner solution, with $t^{c*}=\frac{a_L}{a_L+Ea}$ and $x_L^{c*}=0$, whenever $\Phi\leq\frac{a_L+\gamma}{\gamma}$. In this case $g_L^*=g_H^*=\frac{a_LEA}{a_L+Ea}$. Since $\gamma\leq 1$, we deduce that $\frac{a_L+\gamma}{\gamma}\geq a_L+1\geq 2$. With $\phi=0.5$ we have $\Phi=2$ and $t^{c*}=\frac{a_L+\gamma}{2(a_L+Ea)}$. Substituting this value in the constraint yields $1-t^{c*}-\tau^{c*}=\frac{a_L-\gamma}{2a_L}>0$, which is true by assumption 2 and $U_L^{c*}=\frac{(a_L+\gamma)^2}{4}\frac{Ea}{a_L+Ea}$.

9.7.2 Decentralization of local taxes τ_H and τ_L

In the decentralization case, t is uniform across regions, while the decision about the local taxation and local investment in the public good are decentralized, so that $\tau_H\neq\tau_L$. When the power to choose t lies in L then $ty=\tau_Ly_L$. In other words, the local investment in the public good in region L perfectly complements the national investment in the public good: $Q=ty=q_L=\tau_Ly_L$. We deduce that the per capita level of public good in region L is $g_L=min\{Q,q_L\}=ty$ so that $y_L=a_L(ty)^\phi$. Now that it can choose τ_H freely, region H implements $\tau_H=t\frac{y}{y_H}<\tau_L$. Since it is more productive than region L, region H chooses a lower local tax rate to match the national investment in the public good so that $g_H=min\{Q,q_H\}=ty$ and $y_H=a_H(ty)^\phi$, which implies that $\frac{y_H}{y_L}=\frac{a_H}{a_L}$. We also have by equation (19) that $y_L=\frac{a_L}{Ea}y$ so that $a_L(ty)^\phi=\frac{a_L}{Ea}y$, which implies that $y=\left(Eat^\phi\right)^{\frac{1}{1-\phi}}$. We deduce that $y_H=a_H(tEa)^{\frac{\phi}{1-\phi}}$, that $y_L=a_L(tEa)^{\frac{\phi}{1-\phi}}$, and $g_L=g_H=(tEa)^{\frac{1}{1-\phi}}$. The private consumption of an agent of region L is $x_L=(1-t-\tau_L)y_L=\left(1-\frac{a_L+Ea}{a_L}t\right)a_L(tEa)^{\frac{\phi}{1-\phi}}$. Recall that $\Phi=\frac{1}{1-\phi}$ and $\Phi-1=\frac{\phi}{1-\phi}$. Substituting the values in the utility function defined in (1) one sees that under decentralization the median voter of region L chooses t so as to maximize

$$\max_t U_L^{d*}=\gamma v\left((Eat)^\Phi\right)+\left(a_L-(a_L+Ea)t\right)\left(Eat\right)^{\Phi-1} \tag{64}$$

under the constraint that $1-t-\tau_L = 1-\frac{a_L+Ea}{a_L}t \geq 0$. It is easy to check that (64) is identical to (58). The median voter of region L chooses the same taxation rate under centralization and decentralization, $t^{d*}(\gamma) = t^{c*}(\gamma)$ defined in (59) so that $U_L^{c*} = U_L^{d*}$, which completes the proof of Proposition 3. QED

9.8 Proof of corollary 4

Under democracy, and the choice of taxation by the median voter of region L, the per-capita level of public good available in the poor and the rich region is the same both under centralization and decentralization so that the first term of the utility in (1) of the representative agent of region H is the same as for the agent of region L. What varies is the level of private consumption, which for region H varies with centralization and decentralization.

9.8.1 Utility of the representative agent of region H under centralization in democracy

The level of private consumption of the representative agent of region H under centralization in democracy is: $x_H^{c*} = (1-t^{c*}-\tau^{c*})y_H^{c*} = \left(1-\frac{a_L+Ea}{a_L}t^{c*}\right)\frac{a_H}{Ea}y^{c*}$ where $y = \left(Eat^{\phi}\right)^{\frac{1}{1-\phi}}$. Substituting this value yields: $x_H^{c*} = \left(1-\frac{a_L+Ea}{a_L}t^{c*}\right)\frac{a_H}{Ea}y^{c*} = \frac{a_H}{a_L}x_L^{c*}$. We deduce that in the base case where $\gamma = 0$, one gets $U_H^{c*} = \frac{a_H}{a_L}U_L^{c*}$ leading to $U_H^{c*} \geq U_L^{c*}$. However, the inequality of utilities observed between the two regions decreases with the transition to democracy, since

$$\frac{U_H^{c*}}{U_L^{c*}} = \frac{a_H}{a_L} \leq \lim_{\gamma \to 0}\frac{U_H^{c}}{U_L^{c}} = +\infty. \tag{65}$$

Robustness of the results when $\gamma > 0$: When γ increases, the gap in utility between the rich and the poor region decreases as the weight put on the public good in the utility function increases, while the consumption value remains the same in both regions. To see this point, let's focus on the example where $v(g) = g^{\phi}$ with $\phi = 0.5$. We have $\Phi = 2$ and $t^{c*} = \frac{a_L+\gamma}{2(a_L+Ea)}$. Substituting t^{c*} in $U_H^{c*} = \gamma v\left((Eat)^{\Phi}\right) + \frac{a_H}{a_L}\big(a_L-(a_L+Ea)t\big)\big(Eat\big)^{\Phi-1} = \gamma Eat + \frac{a_H}{a_L}\big(a_L-(a_L+Ea)t\big)Eat$, we are able

to compute the utility levels reached by the representative agent of the rich region:

$$U_H^{c*} = \left(1 + \frac{(k-1)(a_L - \gamma)}{a_L + \gamma}\right) U_L^{c*} \tag{66}$$

Since $0 < \gamma \leq 1$, $k = \frac{a_H}{a_L} \geq 1$ and $a_L > 1$, it is easy to check that $U_H^{c*} \geq U_L^{c*}$. However, one finds that overall inequalities decrease with the transition to democracy. First, the autocrat receives the same utility than the representative citizen of region H. Second, the inequalities between the representative citizen of region H and L are smaller under democracy. That is,

$$\frac{U_H^{c*}}{U_L^{c*}} = 1 + \frac{(k-1)(a_L - \gamma)}{a_L + \gamma} \leq \frac{U_H^{c}}{U_L^{c}} = k + \frac{1-s}{s(N_H - 1)} \frac{(sN_H a_H - \gamma)k + sN_L a_L}{2\gamma} \tag{67}$$

Indeed, one gets that $1 + \frac{(k-1)(a_L-\gamma)}{a_L+\gamma} \leq k$ is equivalent to $a_L - \gamma \leq a_L + \gamma$, which holds when $\gamma \geq 0$. Therefore, equation (67) is always true for all $s \in [\frac{1}{N_H}, 1]$.

9.8.2 Utility of the agent of region H under decentralization in democracy

The level of private consumption of the representative agent of region H under decentralization in democracy is: $x_H^{d*} = (1 - t^{d*} - \tau^{d*}) y_H^{d*} = \left(1 - \frac{a_H + Ea}{a_H} t^{d*}\right) \frac{a_H}{Ea} y^{d*}$ where $y = \left(Eat^{\phi}\right)^{\frac{1}{1-\phi}}$. Substituting this value yields: $x_H^{d*} = \left(a_H - (a_H + Ea)t^{d*}\right) \left(Eat^{d*}\right)^{\Phi - 1}$. Comparing x_H^{d*} with x_L^{d*} yields

$$\frac{x_H^{d*}}{x_L^{d*}} = \frac{a_H}{a_L} \frac{1 - \left(1 + \frac{Ea}{a_H}\right) t^{d*}}{1 - \left(1 + \frac{Ea}{a_L}\right) t^{d*}} > \frac{a_H}{a_L} > 1 \tag{68}$$

We deduce that $U_H^{d*} > U_H^{c*}$ $\forall \gamma \in [0, 1]$ since $g_L^* = g_H^* = (t^*(\gamma) Ea)^{\Phi}$ both under centralization and decentralization in democracy. In the base case where $\gamma = 0$, $U_H^{d*} > U_H^{c*} = \frac{a_H}{a_L} U_L^{c*}$.

Robustness of the results when $\gamma > 0$: Let $v(g) = g^{\phi}$ with $\phi = 0.5$. The optimal solution for the median voter of region L is

$$t^{d*} = \frac{a_L + \gamma}{2\left(a_L + Ea\right)} = t^{c*} \tag{69}$$

Substituting this value in the constraint yields $1-t^{d*}-\tau_L^{d*}=\frac{a_L-\gamma}{2a_L}>0$, which is true by Assumption 2. Substituting t^{d*} in the different quantities yields $y_H^{d*}=a_H\frac{a_L+\gamma}{2}\frac{Ea}{Ea+a_L}$ and $y_L^{d*}=a_L\frac{a_L+\gamma}{2}\frac{Ea}{Ea+a_L}$, and $g_H^*=g_L^*=\frac{(a_L+\gamma)^2}{4}\left(\frac{Ea}{Ea+a_L}\right)^2$. We deduce that

$$U_L^{d*}=\frac{(a_L+\gamma)^2}{4}\frac{Ea}{Ea+a_L} \tag{70}$$

$$U_H^{d*}=\frac{(a_H+\gamma)(a_L+\gamma)}{4}\frac{Ea}{Ea+a_L}\left(2-\frac{\frac{a_L+\gamma}{Ea+a_L}}{\frac{a_H+\gamma}{Ea+a_H}}\right) \tag{71}$$

This is equivalent to

$$U_H^{d*}=\left(2\frac{a_H+\gamma}{a_L+\gamma}-\frac{Ea+a_H}{Ea+a_L}\right)U_L^{d*} \tag{72}$$

Since $\frac{a_H+\gamma}{a_L+\gamma}=1+\frac{a_H-a_L}{a_L+\gamma}$ and $\frac{Ea+a_H}{Ea+a_L}=1+\frac{a_H-a_L}{Ea+a_L}$, we can rewrite equation (72) as

$$U_H^{d*}=\left(1+(a_H-a_L)\left(\frac{2}{a_L+\gamma}-\frac{1}{a_L+Ea}\right)\right)U_L^{d*} \tag{73}$$

Setting $\gamma=0$ and simplifying this equation returns equation (**??**).

Comparing the utility of the representative agent of region H in centralization and decentralization in democracy, we need to show that $U_H^{d*}>U_H^{c*}$. This is equivalent to $\left(1+\frac{a_H-a_L}{a_L+Ea}\frac{2Ea+a_L-\gamma}{a_L+\gamma}\right)U_L^{d*}>\left(1+\frac{a_H-a_L}{a_L}\frac{a_L-\gamma}{a_L+\gamma}\right)U_L^{c*}$. Since $U_L^{c*}=U_L^{d*}$ this inequality is equivalent to $\frac{a_H-a_L}{a_L+Ea}\frac{2Ea+a_L-\gamma}{a_L+\gamma}>\frac{a_H-a_L}{a_L}\frac{a_L-\gamma}{a_L+\gamma}$. Simplifying this inequality we obtain the condition $a_L(2Ea+a_L-\gamma)>(a_L-\gamma)(Ea+a_L)$, which is equivalent to $a_L-\gamma>0$. This is always true by assumption 2. QED

9.9 Decentralization is an accelerator of democratization

The autocratic regime is overthrown if the poor region rebels and wins the contest. There are therefore two forces that potentially play in opposite directions: first, the willingness to rebel, which depends on political grievances and second, the ability to win the rebellion, which depends on the relative amount of resources available to conduct the fight. We assume that the poor region rebels whenever the

utility of the representative citizen falls bellow a certain threshold $\underline{u}$ (i.e., $\underline{u}$ is their reservation utility to renounce fighting the autocrat). The minimum utility required by the poor region to renounce fighting the autocrat is bounded upward by $U_L^{c*} = U_L^{d*} = U^*$, the utility of a representative poor citizen in democracy. The value of the reservation utility is affected by exogenous shock so that $\underline{u}$ is a random variable. We assume that it follows a uniform distribution $\underline{u} \sim U[0, U^*]$. We deduce that, in the centralized case, the probability that the poor region rebels is $1 - P(\underline{u} \leq U_L^c) = 1 - \frac{U_L^c}{U^*}$.

In case the rich region wants to fight the rebellion, we consider a standard contest function whereby the probability for the poor region to win the conflict is $\frac{n_L y_L^j}{n_H y_H^j + n_L y_L^j}$ with $j = \{c, d\}$ (see Corchon and Serena, 2018 for a survey on contest functions). Let $\frac{a_H}{a_L} = k$. By virtue of Proposition 1, the probability that the poor region wins the contest is higher with decentralization: $\frac{n_L}{n_H k + n_L} \geq \frac{n_L}{n_H k^\Phi + n_L}$.

Putting the two strategic elements together, the probability that the autocrat stays in power in the case of centralization is:

$$\alpha_c = \frac{U_L^c}{U_L^{c*}} + \frac{n_H k^\Phi}{n_H k^\Phi + n_L} \left(1 - \frac{U_L^c}{U_L^{c*}}\right) \in (0, 1). \tag{74}$$

It is the sum of the likelihood that the poor region does not rebel (first term) plus the probability that it loses the contest should it rebels (second term).

9.9.1 Base case $\gamma = 0$

Since in the base case with $\gamma = 0$, $U_L^c = U_L^d = 0$, the probability that the poor region rebels is 1. This probability decreases when γ increases as the utility of the representative agent of the poor region becomes strictly positive, when the consumption of the public good enters her utility. We deduce that $\alpha_c = \frac{U_L^c}{U_L^{c*}} + \frac{n_H k^\Phi}{n_H k^\Phi + n_L} \left(1 - \frac{U_L^c}{U_L^{c*}}\right) = \frac{n_H k^\Phi}{n_H k^\Phi + n_L} \in (0, 1)$. Similarly, the probability that the autocrat stays in power in the case of decentralization is: $\alpha_d = \frac{U_L^d}{U_L^{c*}} + \frac{n_H k}{n_H k + n_L} \left(1 - \frac{U_L^d}{U_L^{c*}}\right) = \frac{n_H k}{n_H k + n_L}$ if the rich region fights the rebellion. It is 0 otherwise. Indeed if the people of the rich region do not fight,

the probability of transition is 1. We deduce that when $\gamma = 0$, decentralization is an accelerator of democratization: $\delta = \frac{n_H k}{n_H k + n_L} \mathbb{1}_{\{U_H^d > U_H^{d*}\}} - \frac{n_H k^\Phi}{n_H k^\Phi + n_L} < 0$, where $\mathbb{1}_{\{U_H^d > U_H^{d*}\}}$ is a function that takes the value 1 if $U_H^d > U_H^{d*}$ and 0 otherwise.

9.9.2 Robustness check when $\gamma > 0$:

First of all it should be noted that if γ is sufficiently large and Φ is very large, there are cases where the quasi-linear utility function produces corner solutions: the autocrat maximizes the production of the public good by choosing a level of bribe rate $b = 0$ so that $x_H^d = 0$ (see appendix 9.4). In the decentralized regime, $g_H^d = g_L^d$ and the autocrat has the same utility as the representative agent of the state L. The autocrat by maximizing his utility maximizes also the utility of the agent of L. The utility of the representative agent of L is therefore the same under autocracy and democracy. That is $U_A^d(g_H^d, x_H^d) = \gamma v(g_H^d) = U_L^d(g_L^d, x_L^d) = U^*(g_L^*, x_L^*)$. The probability of rebellion by the poor region under decentralization falls to 0. It is not the case under centralization as $g_H^c > g_L^c$ and the utility of the agent of region L is smaller than in democracy, $U_L^c(g_L^c, x_L^c) = \gamma v(g_L^c) < \gamma v(g_L^*) = U^*(g_L^*, x_L^*)$, so that the probability of rebellion is strictly positive. In this extreme case, $\delta > 0$ and decentralization hinders the transition to democracy, but it's also a case where the autocracy is extremely stable, as the poor region has zero interest in rebelling if the autocrat implement decentralization. This limit case of a pure public good economy, without any bribes diverted by the autocrat, doesn't really fit into our unstable kleptocracy framework. To exclude this possibility, we assume in what follows that $\Phi = 2$. Even when $\gamma = 1$, this assumption guarantees that we have interior solutions in our parametric example in autocracy (see appendix 9.4). We aim to show the robustness of our results under the conditions of Proposition 5 so that $\Phi = 2$.

To prove the robustness of our results when $\gamma > 0$, we focus on the case where $v(g) = g^\phi$, and $N \to +\infty$. Equation (74) can be rewritten as $\alpha_c = \frac{n_H k^\Phi}{n_H k^\Phi + n_L} + \frac{U_L^c}{U_L^{c*}} \left[\frac{n_L}{n_H k^\Phi + n_L} \right]$. Using similar

reasoning for α_d, the term δ can be rewritten as

$$\delta = \frac{n_H k}{n_H k + n_L} - \frac{n_H k^\Phi}{n_H k^\Phi + n_L} + \frac{U_L^d}{U_L^{c*}} \left[\frac{n_L}{n_H k + n_L} \right] - \frac{U_L^c}{U_L^{c*}} \left[\frac{n_L}{n_H k^\Phi + n_L} \right] \tag{75}$$

We have from (63) $U_L^{c*} = \frac{(\Phi-1)^{\Phi-1}}{\Phi^\Phi} \left(\frac{Ea}{a_L + Ea} \right)^{\Phi-1} (a_L + \gamma)^\Phi$. Let $s \in (\frac{1}{N_H}, 1]$. Setting $N \to +\infty$ in (32) yields

$$U_L^c = \gamma \left(\frac{\Phi - 1}{\Phi} \right)^{\Phi-1} \left(\frac{a_L E(a^\Phi)}{a_H^\Phi + E(a^\Phi)} \right)^{\Phi-1} \tag{76}$$

and in (45) it yields

$$U_L^d = \gamma \left(\frac{\Phi - 1}{\Phi} \right)^{\Phi-1} \left(\frac{a_L Ea}{a_L + Ea} \right)^{\Phi-1} \tag{77}$$

Equation (75) is therefore equivalent to

$$\delta = \frac{n_H k}{n_H k + n_L} - \frac{n_H k^\Phi}{n_H k^\Phi + n_L} + \frac{\Phi \gamma n_L a_L^{\Phi-1}}{(a_L + \gamma)^\Phi (n_H k + n_L)} \left[1 - \left(\frac{n_H k^\Phi + n_L}{n_H k + n_L} \right)^{\Phi-2} \left(\frac{1 + n_H k + n_L}{k^\Phi (1 + n_H) + n_L} \right)^{\Phi-1} \right]$$

Setting next $\Phi = 2$ yields:

$$\delta = \frac{n_H k}{n_H k + n_L} - \frac{n_H k^2}{n_H k^2 + n_L} + \frac{2 a_L \gamma n_L}{(a_L + \gamma)^2 (n_H k + n_L)} \left[1 - \frac{1 + n_H k + n_L}{k^2 (1 + n_H) + n_L} \right] \tag{78}$$

This is equivalent to $\delta = \frac{-(k-1) n_H n_L k}{(n_H k + n_L)(n_H k^2 + n_L)} + \frac{2 a_L \gamma n_L}{(a_L + \gamma)^2 (n_H k + n_L)} \frac{k^2 (1 + n_H) - (1 + n_H k)}{k^2 (1 + n_H) + n_L}$, which factorizing $(k-1)$ yields:

$$\delta = \frac{-(k-1) n_L}{n_H k + n_L} \left[\frac{n_H k}{n_H k^2 + n_L} - \frac{2 a_L \gamma}{(a_L + \gamma)^2} \frac{k + 1 + n_H k}{k^2 (1 + n_H) + n_L} \right] \tag{79}$$

A sufficient condition for $\delta \leq 0$ is therefore that

$$\frac{n_H k}{n_H k^2 + n_L} \geq \gamma \frac{2 a_L}{(a_L + \gamma)^2} \frac{k + 1 + n_H k}{k^2 (1 + n_H) + n_L} \tag{80}$$

- When $\gamma \to 0$, (80) is always true, $\delta < 0$, and decentralization is an accelerator of democracy.

By continuity the result that $\delta < 0$ still hold for positive value of γ.

- Note that $\frac{2a_L\gamma}{(a_L+\gamma)^2}$ increases with γ so that δ increases with γ: the more the poor region values the public good, the higher their dissatisfaction at a centralized regime. It is next easy to check that $\frac{2a_L\gamma}{(a_L+\gamma)^2} \leq \frac{1}{2}$ is equivalent to $0 \leq (a_L-\gamma)^2$ which is always true as $\gamma \leq 1 \leq a_L$. (80) is always true (i.e., $\delta < 0$), and decentralization is an accelerator of democracy if $\frac{n_H k}{n_H k^2+n_L} \geq \frac{1}{2}\ \frac{k+1+n_H k}{k^2(1+n_H)+n_L}$, which is always true under the condition that $k \geq \frac{1}{n_H}$ of Proposition 5.

In other words, when the conditions of Proposition 5 hold decentralization is an accelerator of democratic transition.

By contrast if the conditions of Proposition 5 do not hold decentralization can act as a strategic tool for the autocrat to remain in power. When $\gamma \to 1$, there exist cases such that $\delta > 0$. This is true if Φ is large as explained above. This is also true when n_H tends to 0 while $k < \frac{1}{n_H}$ so that $n_H k \to 0$, which implies that (80) is violated. That is, when the rich region is small enough, the probability that the poor region would lose a revolt plummets to 0, and decentralization is one strategic tool to maintain autocracy as $\delta > 0$.

9.10 Proof of $U_H^{c*} < U_H^c$

We focus on the base case with $\gamma = 0$. Moreover we set $\Phi = 2$. It yields

$$U_H^{c*} = \frac{(a_L)^2}{4}\frac{kEa}{a_L + Ea} \tag{81}$$

$$U_H^c = \frac{N(1-s)}{4(N_H-1)}\frac{\left(E(a^2)\right)^2}{a_H^2 + E(a^2)} \tag{82}$$

We aim to find sufficient condition so that $U_H^{c*} < U_H^c$. Setting $a_L = 1$ and $a_H = k$ this is equivalent to:

$$\frac{kEa}{1+Ea} < \frac{N(1-s)}{N_H-1}\frac{\left(E(a^2)\right)^2}{k^2 + E(a^2)} \tag{83}$$

We deduce that if condition

$$\frac{kEa}{1+Ea} < \frac{\left(E(a^2)\right)^2}{k^2+E(a^2)} \tag{84}$$

is satisfied then a sufficient condition for (83) to hold is that $1 \leq \frac{N(1-s)}{N_H-1}$, which is equivalent to

$$s \leq \frac{1+N-N_H}{N} = 1 - n_H + \frac{1}{N} = n_L + \frac{1}{N}. \tag{85}$$

Condition (85) is equivalent to $s \leq n_L$ when $N \to +\infty$. It is easy to check that the RHS is always larger than $\frac{1}{N_H} \to 0$ when $N \to +\infty$. Therefore the condition $s \in [\frac{1}{N_H}, 1]$ is satisfied.

In other words, if condition (84) holds then $U_H^c > U_H^*$. We deduce Assumption 3. Since $\frac{Ea}{1+Ea}\frac{k^2+E(a^2)}{E(a^2)}$ is increasing in k, a sufficient condition for condition (84) to hold is that the productivity gap between the two regions is large enough: $\frac{1+n_H}{n_H^2} \leq k$.

Comparing condition (84) with condition (13) in Proposition 2 when $\Phi = 2$ it is straightforward to see that the former is stronger than the latter if and only if $2\left[\frac{Ea}{1+Ea}\right]^2 \leq \frac{kEa}{1+Ea}$. This is equivalent to $\frac{2Ea}{1+Ea} \leq k$. Substituting $Ea = n_H k + n_L$ and using the fact that $n_L = 1 - n_H$ yields: $0 \leq n_H k^2 + k(2n_L - n_H) - 2n_L$. Solving the second degree equation $n_H k^2 + k(2n_L - n_H) - 2n_L = 0$ for k yields only one positive root $k^+ = 1$. We deduce that under our assumption that $k \geq 1$ Assumption (3), that implies condition (84), is stronger than condition (13). QED

9.11 Proof of Proposition 5

For simplicity sake we focus on large population, i.e. $N \to +\infty$, and normalize $a_L = 1$ so that $a_H = k > 1$ and $Ea = n_L + n_H k$. Let $U^* = \frac{1}{4}\frac{Ea}{1+Ea}$. With $\gamma = 0$, this implies that and

$$U_L^{d*} = U_L^{c*} = U^* < U_H^{c*} = kU^* < U_H^{d*} = U_H^{c*} + (k-1)\frac{Ea}{1+Ea}U_L^{c*} = \left(k + (k-1)\frac{Ea}{1+Ea}\right)U^* \tag{86}$$

The autocrat is a hardliner and neither decentralizes nor initiates a peaceful transition to democracy when $V_A^c > U_H^{d*} > V_A^d$.

The inequality $U_H^{d*} > V_A^d$ is equivalent to $U_H^{d*} > \alpha_d U_A^d + (1-\alpha_d)\big(U_H^{d*} - K\big)$, which after simplification yields: $\alpha_d \left(U_H^{d*} - U_A^d\right) + (1-\alpha_d)K > 0$. It implies that if $U_H^{d*} \geq U_A^d$ then the autocrat never decentralizes if he plans to maintain his autocratic rule: when decentralization occurs it is before a peaceful transition to democracy.

The inequality $V_A^c \geq U_H^{d*}$ is equivalent to $\alpha_c\big(U_A^c - U_H^{c*}\big) - (1-\alpha_c)K \geq U_H^{d*} - U_H^{c*}$. Let $\tilde{K}$ be so that this equation holds with equality:

$$\tilde{K} = \frac{\alpha_c}{1-\alpha_c}\left(U_A^c - U_H^{c*}\right) - \frac{U_H^{d*} - U_H^{c*}}{1-\alpha_c} \tag{87}$$

where $\alpha_c = \frac{n_H k^2}{E(a^2)}$. We deduce that $\tilde{K} \geq 0$ if and only if $\alpha_c \left(U_A^c - U_H^{c*}\right) \geq U_H^{d*} - U_H^{c*} = \frac{k-1}{4}\left(\frac{Ea}{1+Ea}\right)^2$.

Let's first consider the case where the autocrat chooses to redistribute equally his bribes with his followers of region H: $s = \frac{1}{N_H}$. In this case, $U_A^c = \frac{E(a^2)}{4n_H}\frac{E(a^2)}{k^2+E(a^2)}$ so that $\tilde{K} \geq 0$ if and only if

$$\frac{n_H k^2}{E(a^2)}\left(\frac{E(a^2)}{4n_H}\frac{E(a^2)}{k^2+E(a^2)} - \frac{k}{4}\frac{Ea}{1+Ea}\right) \geq \frac{k-1}{4}\left(\frac{Ea}{1+Ea}\right)^2$$

This is equivalent to

$$k^2 \frac{E(a^2)}{k^2+E(a^2)} \geq (k-1)\left(\frac{Ea}{1+Ea}\right)^2 + \frac{n_H k^2}{E(a^2)}\frac{kEa}{1+Ea} \tag{88}$$

Under assumption (3), a sufficient condition for (88) to hold is that

$$k^2 \frac{k}{1+E(a)} \geq (k-1)\left(\frac{Ea}{1+Ea}\right)^2 + \frac{n_H k^2}{E(a^2)}\frac{kEa}{1+Ea} \tag{89}$$

which is equivalent to:

$$\frac{k^2}{E(a)} \geq \frac{k-1}{k}\frac{Ea}{1+Ea} + \frac{n_H k^2}{E(a^2)} \tag{90}$$

A sufficient condition for (90) to hold is that:

$$\frac{k^2}{E(a)} \geq \frac{Ea}{1+Ea} + \frac{n_H k^2}{E(a^2)} \tag{91}$$

which is equivalent to:

$$1 \geq \frac{(Ea)^2}{k^2(1+Ea)} + \frac{n_H Ea}{E(a^2)} \tag{92}$$

It is easy to check that both RHS terms decrease in k. A sufficient condition for (92) to hold is that it holds for $k = 1$, that is:

$$1 \geq \frac{1}{2} + n_H \tag{93}$$

This is equivalent to $n_H \leq \frac{1}{2}$ which is true by Assumption (1). In other words, under Assumption (3), $\tilde{K}$ exists and is positive.

Next, when $s = \frac{1}{N_H}$, $U_A^d = \frac{1}{2n_H}\left(\frac{Ea}{1+Ea}\right)^2$ and since $U_H^{d*} = \left(k + (k-1)\frac{Ea}{1+Ea}\right)\frac{1}{4}\frac{Ea}{1+Ea}$, we deduce that $U_H^{d*} > U_A^d$ is equivalent to $0 < n_H n_L(k-1) + 2Ea(n_H k - 1)$, which is true under the assumption that $k \geq \frac{1}{n_H}$. We deduce that the autocrat prefers first to decentralize and second to peacefully makes the transition to democracy whenever $K \geq \tilde{K}$.

On the other hand, when $K < \tilde{K}$ or $s > \frac{1}{N_H}$, the autocrat's expected utility is higher when he clings to power and keep it centralized. When $s > \frac{1}{N_H}$, the autocrat extracts a larger share than what he redistributes to citizens in H, which implies that $\lim_{N \to +\infty} U_A^c = +\infty$ and $\tilde{K} \to \infty$. Since $n_H > 0$, it is easy to see that the probability $\alpha_c = 1 - \frac{n_L}{n_H k^2 + n_L} = \frac{n_H k^2}{n_H k^2 + n_L}$ is always strictly positive. Consequently, there exists no probability of revolution $(1-\alpha_c)$ high enough for the autocrat's expected income under a centralized autocracy to be lower than under a democracy: $V_A^c > U_H^{d*}$ and the autocrat always chooses to maintain a centralized autocratic system. QED

10 Empirical Analysis

10.1 Data

The different sources of the data used in our analysis are listed below.

- **Transfer dependency and Tax revenue decentralization** The IMF Fiscal Decentralization Database, alongside with the *Fiscal Decentralization Methodological Note* (a detailed description of the dataset) are both available at https://data.imf.org/?sk=1C28EBFB-62B3-4B0C-AED3-048EEEBB684F. For an analysis of the IMF dataset, see Dziobek et al. (2011). The two indexes we use are defined in IMF's methodology as:

$$Transfer\ Dependency \equiv \frac{Net\ transfers\ (received\ less\ paid)}{Local\ government's\ own\ revenue} \tag{94}$$

$$Tax\ Revenue\ Decentralization \equiv \frac{Local\ tax\ revenue}{General\ Government\ tax\ revenue} \tag{95}$$

- **Polity2 score.** We are using the Polity IV Project dataset version 2015. Democracy scores can be found at https://competitivite.ferdi.fr/en/indicators/polity2-polity-iv. The project categorizes countries with an index ranging between -10 to -6 as autocracies, while anocracies range between -5 to +5, and democracies have an index between 6 and 10.

- **Domestic and Foreign Instability**. Information on the Monty G. Marshall, Center for Systemic Peace can be found here http://www.systemicpeace.org/inscr/MEPVcodebook2018.pdf. The data was extracted on July 25, 2019, from http://www.systemicpeace.org/inscrdata.html, see in particular the excel file *Major Episodes of Political Violence, 1946-2018*. The variable *civtot* accounts for the presence and magnitude of major societal events in a country on a given year, encompassing civil violence and war, alongside with ethnic violence and war. The score ranges from 0 to 40 and increases with the magnitude of events, hence capturing the level of

domestic instability.[31] To ease the interpretation of our results, we rename the *civtot* variable, which is not very intuitive, as *Domestic Instability*. The CSP datatset also contains the *totciv* variable, providing information on societal (ethnic and civic) major episodes of political violence and conflict events present in neighboring states, and in countries of general proximity (i.e., in the politically-relevant regional system) as defined by the CSP methodology.[32] We rename this variable as *Foreign Instability*. Both these scores reflect the complexity of conflict episodes and include several dimensions such as state capabilities, area and scope of deaths and destruction, population displacement, and episode duration. Scores are considered to be comparable across episode types for all countries involved.

- **Exchange rates, GDP per capita and countries' population.** These variables originate from the World Bank dataset named the *World Development Indicators*, with panel data available for our period of interest at https://databank.worldbank.org/source/world-development-indicators.

- **Ethnic fragmentation.** The European University Institue provides an index of ethnic fragmentation, that corresponds to the probability that two randomly drawn individuals are not from the same ethnic group. This variable is available in the *Historical Index of Ethnic Fractionalisation* (HIEF) dataset, that can be found at https://cadmus.eui.eu/.

List of countries included in our analysis: The analysis focuses on a set of 36 countries that experienced a polity score lower or equal than 7 at least once during the studied period: Afghanistan, Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Brazil, Bulgaria, Chile, China, Croa-

[31] The *civtot* index is composed of the sum of all the societal *major episodes of political violence* (MEPV) scores for a country at a given year, that is *civviol, civwar, ethviol, ethwar*, representing the magnitude of civil violence, civil war, ethnic violence, and ethnic war respectively. The different instability indicators range from 0 to 10, and represent the destructive impact and magnitude of the violent episode in the affected society (0 being no episode of violence, and 10 being the highest violence). The aggregated index hence ranges between 0 and 40. More information provided in the Appendix, Section 10.1

[32] The *totciv* indicator represents the sum of all magnitude scores capturing the societal (i.e., civil and ethnic) MEPV scores for all neighboring states. An exhaustive list of neighboring countries of each state, is available in the Annex 2 of *Major episodes of political violence (MEPV) and conflict regions, 1946-2018* of the MEPV codebook listed above.

Table 3: Summary Statistics

Countries with a polity score $\leq$ 6 at least once	N	mean	sd	min	max	p10	p25	p75	p90
Transfer Dependency	293	1.49	2.71	-0.38	22.41	0.14	0.40	1.46	2.52
Tax Decentralization	407	0.13	0.12	0.00	0.52	0.02	0.05	0.18	0.32
Polity 2	1013	1.62	6.84	-9.00	10.00	-8.00	-7.00	8.00	9.00
Domestic Instability	958	0.92	1.82	0.00	9.00	0.00	0.00	1.00	3.33
Foreign Instability	958	4.25	5.38	0.00	26.67	0.00	0.00	6.00	12.67
GDP per capita (constant 2010 US$)	991	6290.33	11897.06	187.47	116232.75	819.81	1595.46	6477.77	10732.79
Real effective exchange rate (2010 = 100)	962	397.27	1330.25	0.00	10389.94	0.28	1.80	99.87	1025.94
Population, total (in thousands)	1066	69980.9	207781.9	1019.5	1350695	3069.6	5383.3	44641.5	144894
Ethnic fragmentation	979	.40	.256	.026	.886	.098	.179	.59	.855

tia, El Salvador, Georgia, Honduras, Hungary, Indonesia, Kazakhstan, Kenya, Kyrgyzstan, Moldova, Mongolia, Myanmar, Paraguay, Peru, Poland, Romania, Russia, South Africa, South Korea, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, and Uzbekistan.

10.2 Standardization through z-scores

Given the panel structure of our data and the different variables used, it is relevant to look at standardized units to obtained meaningful comparison across variables and across countries. We therefore apply a z-score methodology, a data normalization method commonly used throughout various research fields to compare observations coming from different samples.[33] For each variable x, a z-score is defined as $Z.x \equiv (x - \mu)/\sigma$, where μ is the mean and σ the standard deviation of variable x. In other words, the z-score compares the value of a variable to its average mean and standard deviation at the country level, across all periods. In our regression analysis, we replace our key measures of political pressure (Polity, Domestic and Foreign) by their standardized units. In order to proxy for a robust political pressure, the main regressors are now the averages z-scores of the relevant variables over the past periods, defined by $E_1(Z.x)_{i,t} = \big(Z.x_{i,t} + Z.x_{i,t-1}\big)/2$. The set of regression analysis hence becomes

$$Y_{i,t} = \beta_0 + \beta_1 E_1(Z.Polity)_{i,t} + \beta_2 E_1(Z.Domestic)_{i,t} + \beta_3 E_1(Z.Foreign)_{i,t} + \beta_4 X_{i,t} + \alpha_i + \mu_t + u^Y_{i,t} \quad (96)$$

[33] See for instance Phan et al., 2021 who used Z-scores to investigate the effect of economic policy uncertainty on financial stability over a set of 23 countries.

where μ_t represents year fixed effects, α_i a country fixed effect, and $X_{i,t}$ includes the same set of controls as before (ethnic fragmentation, GDP per capita, population, exchange rate). Results, in Table 4, are similar to those obtained in Table 2, and virtually all coefficients are more significant than in the baseline regressions (except for the role of foreign instability in transfer decentralization).

Table 4: Correlation between fiscal autonomy and political instability (Z=scores)

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency			Tax decentralization		
$E_1(Z.Polity)$	0.452***	0.415**	0.466**	0.0294***	0.0241***	0.0189**
	(0.162)	(0.203)	(0.216)	(0.00678)	(0.00789)	(0.00821)
$E_1(Z.Domestic)$		-0.852***	-0.819***		0.0214***	0.0214***
		(0.209)	(0.221)		(0.00664)	(0.00681)
$E_1(Z.Foreign)$			-0.772			0.0206**
			(0.473)			(0.00955)
Constant	-9.065***	-3.868	-4.503	-0.569***	-0.0574	0.219
	(3.233)	(6.074)	(9.000)	(0.122)	(0.221)	(0.264)
Observations	256	159	148	345	212	201
R-squared	0.885	0.925	0.928	0.810	0.707	0.674

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for ethnic fragmentation, GDP per capital, population in country, and exchange rate. The variable *Z-Score Domestic* corresponds to the Z-Score of the societal violence variable in the country, the variable *Z-Score Foreign* refers to the Z-Score of the variable civil violence in neighboring state.

10.3 Testing different time lags for past instability

Presumably, fiscal decentralization reforms may take time to be implemented, which is why our main regressors are constituted of the average values between current and past year. We explore the robustness of our results to the inclusion of additional time lags in the main independent variables, at $t-2$ and $t-3$, both for the main regression and the use of z-scores.

Defining $E_j(x)_{i,t} \equiv \frac{1}{j}\sum_{k=0}^{j} x_{i,t-j}$, Tables 5 and 6 display the set of regression below for each $Y = \{Transfer\ dependency,\ Tax\ decentralization\}$, and each $j = \{2, 3\}$:

$$Y_{i,t} = \beta_0 + \beta_1 E_j(Polity)_{i,t} + \beta_2 E_j(Domestic)_{i,t} + \beta_3 E_j(Foreign)_{i,t} + \beta_4 X_{i,t} + \alpha_i + \mu_t + u^Y_{i,t} \quad (97)$$

Similarly, Tables 7 and 8 include past levels of instabilities when looking at the standardized z-scores of the democracy index and instability measures. Defining $E_j(z.x)_{i,t} \equiv \frac{1}{j}\sum_{k=0}^{j} z.x_{i,t-j}$, with $Z.x \equiv (x-\mu)/\sigma$, whereby μ is the mean and σ the standard deviation of variable x, we look at the following regressions for $Y = \{Transfer\ dependency,\ Tax\ decentralization\}$, and each $j = \{2, 3\}$:

$$Y_{i,t} = \beta_0 + \beta_1 E_j(Polity)_{i,t} + \beta_2 E_j(Z.Domestic)_{i,t} + \beta_3 E_j(Z.Foreign)_{i,t} + \beta_4 X_{i,t} + \alpha_i + \mu_t + u^Y_{i,t} \quad (98)$$

Tables 5 to 8 show that, overall, results from Table 2 still hold when including up to three past years in the main averages.[34] That is, an increase in past domestic instabilities is associated with a lower transfer dependency and a higher tax revenue decentralization, including when accounting for a sustained political instability encompassing events up to three years ago.

Table 5: Correlation between transfer dependency and political pressure (including t-2 and t-3 levels)

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency					
$E_2(Polity)$	0.239***	0.158***	0.162***			
	(0.0561)	(0.0572)	(0.0571)			
$E_2(Domestic)$		-0.583***	-0.617***			
		(0.137)	(0.139)			
$E_2(Foreign)$			-0.122			
			(0.0874)			
$E_3(Polity)$				0.275***	0.184***	0.184***
				(0.0570)	(0.0598)	(0.0597)
$E_3(Domestic)$					-0.582***	-0.635***
					(0.148)	(0.153)
$E_3(Foreign)$						-0.137
						(0.106)
Constant	-11.08***	-8.276**	-8.647**	-11.44***	-8.795**	-9.135***
	(3.485)	(3.415)	(3.418)	(3.450)	(3.403)	(3.407)
Observations	259	259	259	259	259	259
R-squared	0.889	0.897	0.898	0.891	0.899	0.899

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for ethnic fragmentation, GDP per capital, population in country, and exchange rate. *Domestic* corresponds to the *Domestic Instability* variables, the variable *Foreign* refers to the variable *Foreign Instability*.

[34] Although tax decentralization results lose some of their significance when including variables up to three years ago (*t-3*), the *Domestic instability* coefficient is significant at the 99 percent level when looking at z-scores rather than levels.

Table 6: Correlation between tax autonomy and political pressure (including t-2 and t-3 levels)

	(1)	(2)	(3)	(4)	(5)	(6)
	Tax decentralization					
$E_2(Polity)$	0.00396*	0.00584***	0.00528**			
	(0.00208)	(0.00213)	(0.00214)			
$E_2(Domestic)$		0.0184***	0.0175***			
		(0.00574)	(0.00575)			
$E_2(Foreign)$			0.00543*			
			(0.00312)			
$E_3(Polity)$				0.00263	0.00408*	0.00321
				(0.00210)	(0.00220)	(0.00223)
$E_3(Domestic)$					0.0135**	0.0119*
					(0.00625)	(0.00628)
$E_3(Foreign)$						0.00657*
						(0.00346)
Constant	-0.328***	-0.392***	-0.405***	-0.313***	-0.358***	-0.370***
	(0.115)	(0.115)	(0.115)	(0.116)	(0.117)	(0.117)
Observations	350	350	350	347	347	347
R-squared	0.829	0.835	0.836	0.827	0.830	0.832

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for ethnic fragmentation, GDP per capital, population in country, and exchange rate. *Domestic* corresponds to the *Domestic Instability* variables, the variable *Foreign* refers to the variable *Foreign Instability*.

Table 7: Correlation between transfer dependency and political pressure (past Z-scores)

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency					
$E_2(Z.Polity)$	0.545***	0.560***	0.613***			
	(0.160)	(0.193)	(0.202)			
$E_2(Z.Domestic)$		-0.814***	-0.802***			
		(0.197)	(0.206)			
$E_2(Z.Foreign)$			-1.272**			
			(0.511)			
$E_3(Z.Polity)$				0.658***	0.637***	0.682***
				(0.163)	(0.196)	(0.204)
$E_3(Z.Domestic)$					-0.960***	-1.034***
					(0.222)	(0.233)
$E_3(Z.Foreign)$						-1.480**
						(0.594)
Constant	-8.152***	-8.906**	-11.34***	-8.510***	-9.337***	-12.03***
	(2.088)	(3.414)	(4.058)	(2.075)	(3.359)	(4.017)
Observations	270	173	155	270	173	155
R-squared	0.887	0.926	0.930	0.889	0.928	0.933

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for ethnic fragmentation, GDP per capital, population in country, and exchange rate. The variable *Z-Score Domestic* corresponds to the Z-Score of the *Domestic Instability* variable, the variable *Z-Score Foreign* refers to the Z-Score of the variable Foreign Instability.

Table 8: Correlation between tax autonomy and political pressure (past Z-scores)

	(1)	(2)	(3)	(4)	(5)	(6)
	Tax decentralization					
$E_2(Z.Polity)$	0.0253***	0.0168*	0.0119			
	(0.00719)	(0.00863)	(0.00898)			
$E_2(Z.Domestic)$		0.0215***	0.0218***			
		(0.00775)	(0.00798)			
$E_2(Z.Foreign)$			0.0218*			
			(0.0111)			
$E_3(Z.Polity)$				0.0190**	0.00710	0.00245
				(0.00756)	(0.00937)	(0.00976)
$E_3(Z.Domestic)$					0.0178**	0.0180*
					(0.00896)	(0.00923)
$E_3(Z.Foreign)$						0.0215*
						(0.0124)
Constant	-0.581***	-0.0253	0.264	-0.579***	0.0499	0.347
	(0.124)	(0.229)	(0.273)	(0.126)	(0.235)	(0.281)
Observations	342	209	198	339	206	195
R-squared	0.807	0.696	0.662	0.803	0.688	0.652

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for ethnic fragmentation, GDP per capital, population in country, and exchange rate. The variable *Z-Score Domestic* corresponds to the Z-Score of the *Domestic Instability* variable, the variable *Z-Score Foreign* refers to the Z-Score of the variable Foreign Instability.

10.4 Lag between fiscal decision and implementation: removing current levels

Let's now test our results if we remove the current levels of democracy as measured by Polity index and instabilities from the equation, and only focus on past instabilities. That is, this section shows results using the average values of last and second to last year. For each $Y = \{Transfer\ dependency,\ Tax\ decentralization\}$, Table 9 displays the set of regression similar to equation (97), whereby we replace $E_j(x)_{i,t}$ by $E_{02}(x)_{i,t} \equiv \frac{1}{j}\sum_{k=1}^{2} x_{i,t-j}$. Table 10 focuses on z-scores and looks at regressions similar to equation (98), but replaces $E_j(z.x)_{i,t}$ by $E_{02}(z.x)_{i,t} \equiv \frac{1}{j}\sum_{k=1}^{j} z.x_{i,t-j}$.

We find that, overall, past results still hold, with variation in coefficients' significance. An increase in domestic instability reduces local transfer dependency, both in levels and z-scores tables. Coefficients for domestic instabilities lose part of their significance for the tax decentralization ratio, but remain positive and significant with 95 and 90 percent confidence intervals (for levels and z-scores

respecively). Interestingly, we find again some evidence that transfer dependency may decrease with past foreign instability (coefficient significant at 95 percent, see Table 10). The tax revenue decentralization also seem positively affected by past foreign instability, although the coefficient is at best significant at the 90 percent confidence interval only (Table 9).

Table 9: Correlation between fiscal autonomy and past political instability, without current values

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency			Tax decentralization		
$E_{02}(Polity)$	0.213***	0.156***	0.156***	0.00265	0.00370*	0.00327
	(0.0511)	(0.0516)	(0.0517)	(0.00193)	(0.00198)	(0.00199)
$E_{02}(Domestic)$		-0.485***	-0.490***		0.0116**	0.0110**
		(0.125)	(0.128)		(0.00547)	(0.00546)
$E_{02}(Foreign)$			-0.0127			0.00497*
			(0.0819)			(0.00285)
Constant	-10.67***	-8.659**	-8.664**	-0.310***	-0.346***	-0.361***
	(3.493)	(3.420)	(3.428)	(0.115)	(0.115)	(0.115)
Observations	260	260	260	351	351	351
R-squared	0.887	0.894	0.894	0.828	0.831	0.832

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for ethnic fragmentation, GDP per capital, population in country, and exchange rate.

Table 10: Correlation between fiscal autonomy and past political instability, without current values(Zscores)

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency			Tax decentralization		
$E_{02}(Z.Polity)$	0.507***	0.498***	0.531***	0.0160**	0.00311	2.94e-05
	(0.149)	(0.184)	(0.190)	(0.00662)	(0.00789)	(0.00821)
$E_{02}(Z.Domestic)$		-0.791***	-0.837***		0.0131*	0.0129*
		(0.203)	(0.208)		(0.00721)	(0.00741)
$E_{02}(Z.Foreign)$			-1.233**			0.0145
			(0.574)			(0.00989)
Constant	-9.099***	-6.817	-10.23	-0.559***	0.106	0.372
	(3.213)	(5.986)	(8.787)	(0.125)	(0.230)	(0.272)
Observations	257	159	148	343	209	198
R-squared	0.886	0.926	0.930	0.803	0.687	0.648

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for ethnic fragmentation, GDP per capital, population in country, and exchange rate. The variable *Z-Score Domestic* corresponds to the Z-Score of the societal violence variable in the country, the variable *Z-Score Foreign* refers to the Z-Score of the variable civil violence in neighboring state.

11 Online appendix

11.1 Robustness: Cobb-Douglas utility function

We aim to check the robustness of our base results to other form of preferences than quasi-linear ones. We investigate the case where there is some substitution between local and national public goods in the preference of the citizen of region $r = \{H, L\}$ in the form of the following Cobb-Douglas utilities functions,

$$u(q_r, Q, x_r) = q_r^{0.5\alpha} Q^{0.5\alpha} x_r^{1-\alpha} \tag{99}$$

with $0 < \alpha < 1$ and where q_r is the per-capita level of available local public good, Q the per-capita level of national public good and x_r the per-capita level of private consumption.

Production functions are unchanged. The per capita production function of the private good in region $r = \{H, L\}$ remains defined by

$$y_r = a_r \left(\min\{q_s, Q\}\right)^{0.5} \tag{100}$$

It implies that the results of Section 3 and Proposition 1 still hold,

$$\frac{y_H^c}{y_L^c} = \left(\frac{a_H}{a_l}\right)^2 > \frac{y_H^d}{y_L^d} = \frac{a_H}{a_l} \tag{101}$$

11.2 Centralized autocratic power lies in H

Let $E_a \equiv n_H a_H + n_L a_L$ and $E(a^2) \equiv n_H a_H^2 + n_L a_L^2$. When the power lies in H we know from the proof of Lemma 1 that $y_H = (1-b)tE(a^2)$, $y_L = (1-b)tE(a^2)\frac{a_L^2}{a_H^2}$ and $y = (1-b)t\frac{E(a^2)^2}{a_H^2}$. To keep the exposition simple, we set the bribe rate to $b = 0$. Introducing a positive bribe will shift the results in favor of centralization, as the autocrat is more able to divert public funds in the centralized regime than in a decentralized regime. When $b = 0$, the autocrat maximizes the utility of the representative

agent of region H. He chooses t so as to maximize the utility function defined in equation (99), where the private consumption is $x_H = (1-t-\tau)y_H$. Let $\Psi \equiv \frac{a_H^2+E(a^2)}{a_H^2}$. We can check that $1-t-\tau = 1-t-t\frac{y}{y_H} = 1-t\Psi$. The autocrat solves the following maximization,

$$\max_t U_H = \frac{E(a^2)^{1+\alpha}}{a_H^{2\alpha}} t^{1+\alpha} (1-\Psi t)^{1-\alpha} \tag{102}$$

The optimal solution is found at

$$t^c = \frac{1+\alpha}{2\Psi} \tag{103}$$

It is a (local) maximum, as the second derivative is such that $\frac{d^2U_H}{dt^2} < 0$ for $t = t^c$. Substituting the value of equation (103) in the budget constraint yields $1-t-\tau = 1-\frac{1+\alpha}{2\Psi}\Psi = \frac{1-\alpha}{2} > 0$, hence the tax system is implementable.

Introducing t^c in the different quantities allows us to compute the utility levels reached by the representative agent of each region. Looking at agents in region H, we have $q_H = Q$ so that

$$U_H^c = Q^\alpha [(1-t^c-\tau)y_H]^{1-\alpha} \tag{104}$$

$$U_H^c = \frac{(1-\alpha)^{1-\alpha}}{4a_H^{2\alpha}} \left[\frac{(1+\alpha)E(a^2)}{\Psi}\right]^{1+\alpha} \tag{105}$$

For the representative agent of region L we have

$$U_L^c = q_L^{0.5\alpha} Q^{0.5\alpha} [(1-t^c-\tau)y_L]^{1-\alpha} \tag{106}$$

$$= \frac{(1-\alpha)^{1-\alpha}}{4a_H^{2\alpha}} \left[\frac{(1+\alpha)E(a^2)}{\Psi}\right]^{1+\alpha} \left(\frac{a_L}{a_H}\right)^{2-\alpha} \tag{107}$$

$$= U_H^c \left(\frac{a_L}{a_H}\right)^{2-\alpha} \tag{108}$$

11.3 Decentralization in autocracy

In the decentralization case, t is uniform across regions but the taxation and the decision about the local public good is decentralized at the region level. If region $r = \{H, L\}$ has the power to decide its local taxes it sets τ_r so that $\tau_r y_r = ty$. We deduce that $\tau_r^*(t) = \frac{ty}{y_r}$ so that $\frac{y_H}{y_L} = \frac{a_H}{a_L}$ for each region $r = \{H, L\}$.

In autocracy, the power to choose t still lies in H so that $y_H = a_H\sqrt{ty}$. We have that $y_H = ta_H Ea$, $y_L = ta_L Ea$ and $y = (Ea)^2 t$. This implies $Q = q_H = q_L = t^2(Ea)^2$.

Let $\psi_H \equiv \frac{a_H + Ea}{a_H}$. The autocrat maximizes the utility of the representative agent of region H. He chooses t so as to maximize the utility function defined in equation (99), where the private consumption is $x_H = (1 - t - \tau_H)y_H = (1 - t\psi_H)y_H$. He solves the following maximization:

$$\max_t U_H = (Ea)^{2\alpha}(a_H Ea)^{1-\alpha}\ t^{1+\alpha}\ (1 - \psi_H t)^{1-\alpha}. \tag{109}$$

The optimal solution for region H is thus

$$t^d = \frac{1+\alpha}{2\psi_H} \tag{110}$$

This solution is (locally) optimal since the second derivative of the utility function is negative for $t = t^d$. Substituting the value t^d in the tax feasibility constraint yields $1 - t^d - \tau_H = \frac{1-\alpha}{2} > 0$. In other words, the autocrat choose the same level of total taxation under centralization and decentralization. Comparing t^c and t^d, it is easy to check that $t^c > t^d$ is equivalent to $\frac{Ea^2}{a_H^2} < \frac{Ea}{a_H}$, which is true since $a_H > a_L$. It means that under decentralization the autocrat reduces the national tax rate dedicated to finance the national public good and increases the local tax rate for region H.

We next turn to the choices made by the poor region L under decentralization of local taxes under autocracy. We have that $y_L = a_L t^d Ea$ and $y_H = a_H t^d Ea$ so that $Q = q_L = \left(t^d\right)^2 (Ea)^2$. Let

$\psi_L \equiv \frac{a_L+E_a}{a_L}$. We need to check that it exists some range of parameters so that the tax feasibility constraint of region L is satisfied by the solution chosen for t by the rich region H. It must be the case that $1 - t^d - \tau_L = 1 - \frac{1-\alpha}{2}\frac{\psi_L}{\psi_H} \geq 0$, which is equivalent to $1 + \alpha + \frac{Ea}{a_H}\left(2 - (1-\alpha)\frac{a_H}{a_L}\right) > 0$. Substituting $Ea = n_H a_H + n_L a_L$ by its value, a sufficient condition for this inequality to hold is

$$\frac{a_H}{a_L} < \frac{3n_H + \alpha(2 - n_H)}{n_H(1-\alpha)} \tag{111}$$

It is easy to see that the RHS of inequality (111) is larger than 3 for all $\alpha \in [0, 1)$. We deduce that whenever $a_H < 3a_L$, the inequality (111) always holds strictly for all $n_H \in [0, 1]$. Similarly, when α converges to 1, the RHS becomes infinite and (111) always holds strictly. By continuity it holds for value of α close enough from 1. It implies that there exists a non-empty set so that the interior solution described above is the equilibrium.

Substituting the equilibrium quantities we are now able to compute the utility levels reached by the representative agent of each region.

$$U_H^d = \left(\frac{(1+\alpha)Ea}{a_H + Ea}\right)^{1+\alpha}\left(\frac{a_H}{2}\right)^2(1-\alpha)^{1-\alpha} \tag{112}$$

$$\begin{aligned} U_L^d &= \left(\frac{(1+\alpha)Ea}{a_H + Ea}\right)^{1+\alpha}\left(\frac{a_H}{2}\right)^2(1-\alpha)^{1-\alpha}\left(\frac{a_L}{a_H}\right)^{1-\alpha}\left(\frac{2}{1-\alpha} - \frac{\psi_L}{\psi_H}\right)^{1-\alpha} && (113)\\ &= U_H^d\left(\frac{a_L}{a_H}\right)^{1-\alpha}\left(\frac{2}{1-\alpha} - \frac{\psi_L}{\psi_H}\right)^{1-\alpha} && (114) \end{aligned}$$

The last term is strictly positive if condition (111) holds.

11.4 Democratic transition: the power to choose t lies in L

Under democracy, the median voter is in the region L. She always chooses t the tax level to finance the national public good. Under centralization, she also chooses the taxation level to finance the local public goods, which is uniform at τ for both regions. Under decentralization, she cannot decide for the region H and chooses the local tax τ_L only for the region L. She can also implement fiscal reforms and choose to decentralize if it is in her best interest.

11.4.1 Centralization when power lies in L

In the centralized case, when the power lies in L then $\frac{y_H}{y_L} = \frac{a_H}{a_L}$. Everything else being equal, the productivity ratio is the same when either centralization holds and the poor region chooses both local and national taxes, or when decentralization holds and the rich region chooses national taxes. We deduce that $y_L = a_L tEa$ and $y_H = a_H tEa$ so that $Q = q_L = t^2(Ea)^2$ and $q_H = \frac{a_H}{a_L} t^2(Ea)^2$. Let $\psi_L \equiv \frac{a_L + E_a}{a_L}$. The representative agent of region L chooses t so as to maximize the utility function defined in (99) where the private consumption is $x_L = (1 - t - \tau)y_L = (1 - t\psi_L)y_L$. He solves the following equation

$$\max_t U_L = (Ea)^{1+\alpha}(a_L)^{1-\alpha}\ t^{1+\alpha}\ (1 - t\psi_L)^{1-\alpha}. \tag{115}$$

The optimal solution for L is then

$$t_L^c = \frac{1+\alpha}{2\psi_L} \tag{116}$$

Substituting this value in the constraint yields $1 - t - \tau = \frac{1-\alpha}{2} > 0$, hence the tax system is implementable. Substituting t_L^c in the different quantities we are able to compute the utility levels reached by the representative agent of each region:

$$U_L^{c*} = \left(\frac{(1+\alpha)Ea}{a_L + Ea}\right)^{1+\alpha} \left(\frac{a_L}{2}\right)^2 (1-\alpha)^{1-\alpha} \tag{117}$$

$$U_H^{c*} = \left(\frac{(1+\alpha)Ea}{a_L + Ea}\right)^{1+\alpha} \left(\frac{a_L}{2}\right)^2 (1-\alpha)^{1-\alpha} \left(\frac{a_H}{a_L}\right)^{1-\alpha} \tag{118}$$

When computing the ratio, one gets

$$\frac{U_H^{c*}}{U_L^{c*}} = \left(\frac{a_H}{a_L}\right)^{1-\alpha} > 1 \tag{119}$$

since $a_H > a_L$. Comparing equations (108) and (119) we deduce easily that under centralization, when power is autocratic and lies in H, inequalities are larger between the two regions than when power is democratic and lies in region L, with

$$\frac{U_H^{c*}}{U_L^{c*}} = \left(\frac{a_H}{a_L}\right)^{1-\alpha} < \frac{U_H^{c}}{U_L^{c}} = \left(\frac{a_H}{a_L}\right)^{2-\alpha} \tag{120}$$

11.4.2 Decentralization when power to choose t lies in L

When the power to choose t lies in L then $ty = \tau_L y_L$ so that the production of the local public good in region L ($q_L = \tau_L y_L$) perfectly complements the production of the national public good $Q = ty$. We deduce that $y_L = a_L\sqrt{ty}$. Now that it can choose τ_H freely, region H implements $\tau_H = t\frac{y}{y_H} < \tau_L$. Since it is more productive than region L, region H chooses a lower local tax rate to match the available provision of national public good so that $y_H = a_H\sqrt{ty}$. Relying on the same reasoning as before yields that $y_H = a_H tEa$, $y_L = a_L Eat$, $Q = yt = (Ea)^2t^2$. Substituting these values in the utility function where the private consumption is $x_L = (1-t-\tau_L)y_L = (1-t\psi_L)y_L$, the representative agent of region L hence chooses t so as to maximize

$$\max_t U_L = (Ea)^{1+\alpha}(a_L)^{1-\alpha}\ t^{1+\alpha}(1-t\psi_L)^{1-\alpha} \tag{121}$$

The optimal solution is given by

$$t_L^d = \frac{1+\alpha}{2\psi_L} \tag{122}$$

It is a (local) maximum as the second derivative of the utility function is negative at $t = t_L^d$. Substituting this value in the feasibility tax constraint yields $1 - t_L^d - \tau_L = \frac{1-\alpha}{2} \geq 0$.

The region H willing to maximize its total production will choose local taxation so that $\tau_H y_H = t_L^d y$. We have that $1 - t_L^d - \tau_H = 1 - \frac{(1+\alpha)\psi_H}{2\psi_L} \geq 0$, which is always true by assumption 2. We deduce that

$$U_L^{d*} = \left(\frac{(1+\alpha)Ea}{a_L + Ea}\right)^{1+\alpha} \left(\frac{a_L}{2}\right)^2 (1-\alpha)^{1-\alpha} \tag{123}$$

$$\begin{aligned} U_H^{d*} &= \left(\frac{Ea}{a_L + Ea}\right)^{1+\alpha} \left(\frac{(1+\alpha)a_L}{2}\right)^2 \left(\frac{2}{1+\alpha} - \frac{\psi_H}{\psi_L}\right)^{1-\alpha} \left(\frac{a_H}{a_L}\right)^{1-\alpha} && (124) \\ &= U_L^{d*} \left(\frac{2}{1+\alpha} - \frac{\psi_H}{\psi_L}\right)^{1-\alpha} \left(\frac{1+\alpha}{1-\alpha}\right)^{1-\alpha} \left(\frac{a_H}{a_L}\right)^{1-\alpha} && (125) \end{aligned}$$

We are now ready to established our main result under Cobb-Douglas preferences.

Proposition 6. *In the transition to democracy, the region L is indifferent between centralization and decentralization, i.e., $U_L^{c*} = U_L^{d*}$. By contrast, the region H strictly prefers decentralization to centralization, that is, $U_H^{c*} < U_H^{d*}$. It implies that if the autocrat anticipates a transition to democracy he will choose to implement decentralization reforms ahead of the democratization change.*

Proof Comparing equations (117) and (123), it is straightforward to see that $U_L^{c*} = U_L^{d*}$. Now, comparing equation (118) and (124) yields that $U_H^{d*} > U_H^{c*}$ is equal to $\left(\frac{2}{1+\alpha} - \frac{\psi_H}{\psi_L}\right)^{1-\alpha} \left(\frac{1+\alpha}{1-\alpha}\right)^{1-\alpha} > 1$, which is equivalent to $1 > \frac{\psi_H}{\psi_L}$. The last part is always true since $a_H > a_L$.