Decentralisation in Autocracies

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Decentralization in Autocracies [*]

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Abstract

In a model with two regions, one rich and one poor, the allocation of net public spending is studied whereby the initial political process by which taxation and government expenditures are determined is centralized and not democratic. In stable autocracy, decentralization reforms depend on a trade-off: centralization allows a higher rate of rent extraction for the autocrat, but at the cost of reduced productivity in the poor region. Faced with democratic pressure and instability, an authoritarian regime captured by the elite will choose to implement decentralization reforms before democratization because the median voter, who typically lives in a poor rural area, will have no interest in doing so. In democracy, the welfare of the elite is higher with decentralization than with centralization, while the welfare of the poor median voter is identical in both regimes.

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

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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] Some studies 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. The OCDE (2019) hence defines 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, this causal link between democracy and decentralization is challenged by others studies. In fact, democracy is neither necessary nor sufficient to decentralization. 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). 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). 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.

Our analysis shows that an autocratic regime may choose to decentralize for at least two reasons. First, even though his capacity to extract rents is greater in a centralized system, the autocrat may decentralize in time of stability because it increases the productivity of the poor region, and this

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[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.

efficiency gain may lead to higher rents for him and his clique. Second, if there is instability, the pressure of democratization may lead an autocratic regime to decentralize to protect the assets of the ruling elite in the event of a democratic transition. Finally, decentralization reforms affect popular grievances and the capacity of the population to revolt, implying that decentralization reforms can be a catalyst for democratic transition.

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).[2] The more populated region is the poor region. In both region there is a private sector that is taxed to finance public goods. Public revenues are therefore endogenous, and the autocrat diverts part of the taxes collected at the central level for his private use. There are two types of goods that are financed with the remaining public funds. The first is a national public good, whose potential benefits accrue to all citizens of the country, and the second is a local public good. National and local public goods are complementary. 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 universities are useless if there are no locally available primary and secondary schools. An interesting and original feature of the model is that complementary national and local public goods are an input into the production process, so that the productivity and wealth of each region is endogenous. Taxes are levied on final output so that the level of tax available to the regions and the autocrat is also endogenous. To our knowledge, this is new in the theoretical literature on decentralization reforms, as most articles focus on the allocation of fiscal resources to local public goods under the assumption

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[2]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, considered an important element of participatory democracy around the world (Bardhan and Mookherjee, 2006).

that tax revenues or output are fixed. We show several interesting results.

The model starts from a situation where an autocratic and centralized government is captured by the rich region/elite, and 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 studies two fiscal regimes. Under centralization, all public goods (national and local) are chosen by the central government and are financed by a national tax. Under decentralization, local public goods are financed by local taxes, chosen by the local government, while the national public good remains chosen by the central government and financed by central taxes. We show that when power resides in the rich state and is centralized, productivity and welfare inequalities between the two regions are the highest. This result hinges on the assumption that the central government is unable to tailor the local public good to local conditions, for instance because of problems of asymmetric information. Inequality is minimized when either central power resides in the poor state, as would be the case in a median voter-led democracy, or when it is decentralized. This equivalence result obtained in an autocratic setting without people mobility is consistent with the argument that decentralization 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 (e.g., through a more efficient allocation of public goods) is ambiguous, as it depends crucially on the nature of local and national institutions, which may, for example, face problems of accountability and capacity, espe-

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cially in developing countries (Oates, 1993; Bardhan, 2002; Knack and Keefer, 1997; Treisman, 2000; Foster and Rosenzweig, 2001; Arze del Granado et al., 2012; Ahmad et al., 2005). Studies focused on autocracies or weak democracies suggest (with substantial heterogeneity in their empirical strategy and in their results) that decentralization reforms tend to increase local public good provision, including access to basic public utilities services, such as sanitation or electricity, or schooling and health care, 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). Faguet (2004), who studied Bolivia's post-1994 decentralization initiative, finds that public investment in education, water, and sanitation increased significantly in three-quarters of the municipalities, and the investments responded to measures of local needs.[3] 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 identification techniques used in the articles. They also illustrate that, in practice, decentralization reforms are not the work of benevolent planners. Another strand of the theoretical literature therefore focuses on strategic motives for decentralization, such as rent-seeking or power retention, while generally maintaining the assumption of the democratic framework (see Crémer and Palfrey, 1996; Panizza, 1999; Bardhan and

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[3]For instance the expansion of public spending on education was greater on average in municipalities with lower literacy rates or with fewer private schools (Faguet, 2004).

Mookherjee, 2000; Besley and Coate, 2003; Montero and Samuels, 2004; Dickovick, 2006; Eaton et al., 2011). This article examines the relationship between the threat of political change (i.e., a transition to democracy) and fiscal decentralization in the context of an autocracy. The autocrat's political choices are dictated by what will happen to him and his supporters in the event of a democratic transition. For ease of comparison with the equilibrium in the autocratic framework, we assume that the median voter governs in the case of a transition to democracy. This is harmless in our framework because the regions are homogeneous with a representative agent in each. This standard assumption is a convenient shortcut that allows us to bypass the complexity of electoral processes in a democracy.[4]

A key result of the paper is an equivalence result: our analysis reveals that the median voter under democracy is indifferent between centralization and 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. When power shifts from the rich to the poor region, the welfare of the former autocratic elite is higher if the level of local public goods is chosen and financed locally, while the welfare of the representative agent in the poorer state is the same whether or not there is decentralization. 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. This result can be illustrated by several episodes of decentralization that occurred throughout the globe. 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

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[4]There is a rich literature in political economy that studies electoral processes in democracies. It shows that political processes (e.g., majoritarian or proportional representation see Genicot et al., 2021, approval voting see Bouton and Castanheira, 2012) and parties internal organization (e.g., see Crutzen et al., 2010), matter a great deal for efficiency of the political process and fairness. For instance Aragonès et al., 2015 shows that political competition impacts the issues that are debated and pushed by parties through voters priming. We black-box this rich and complex processes here to focus on the engine of autocratic decentralization reforms under the threat of democratization reforms.

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. Sepulveda and Martinez-Vazquez (2011) suggest that richest populations might use decentralization to protect themselves from "unwanted re-distributive policies". This result concurs with the insights derived in our model, that is, decentralization benefits the higher income group when the median voter is poor and might get hold of power through a democratic transition.

Third, consistent with the insights from the literature on the political economy of reforms, 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 lower citizens' willingness to revolt by reducing their grievances and their need for greater local accountability. In this sense, decentralization can be used by autocrats to stall the transition to democracy, and act as a palliative to authoritarian governments (Grindle, 2007). On the other hand, by increasing the amount of resources available to regions and enhancing their autonomy, a decentralization process could 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 dominates: decentralization does accelerate democracy.

The rest of the paper is organized as follow. To motivate our theoretical analysis, section 2 provides empirical evidences on the correlation between, on the one hand, social unrest and democratization pressure and, on the other hand, decentralization in non-democratic countries. Section 3 sets up the structure of the model, while section 4 focuses on the productivity gap between the two regions under centralization and decentralization. Section 5 details the optimal policy choices in the case of a stable autocracy. The analysis is complemented by introducing the possibility of a future transition to democracy, both exogenous in section 6 and endogenous in section 7. Finally, section 8 concludes.

2 Empirical evidences

To motivate our theoretical model, we provide empirical evidence 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. This 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). Our work builds on previous empirical research on the set of decisions undertaken by an authoritarian regime foreseeing a democratic transition. For example, Geddes (2004) used data on post-1945 authoritarian regimes to show that a single-partisan government anticipating a regime change would prefer democracy to any authoritarian regime. We supplement this analysis by studying how social unrest and instability faced by the regime can affect fiscal reforms, accounting both for domestic and neighboring pressures. We find that an increase in domestic and foreign political instability during the past years is correlated with higher fiscal decentralization, i.e., localities rely relatively less on transfers from the central government and more on their local taxes as a source of revenue. These results are consistent with the theoretical results of the paper. They show that non-democratic regimes tend to decentralize after they have been threaten by popular uprising and social unrest.

2.1 Data

The database covers 1980-2012, a period during which large decentralization reforms took place throughout the world. The Polity IV project created the *polity* index, which evaluates democracy levels across countries and ranges between -10 and 10. The project defined a country as democratic if it has a *polity* score of at least 6.[5] The scope of this paper being to study non-democratic regimes

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[5]More information on the Polity2 score in the Appendix, Section 11.1

(autocracies and anocracies), we discard any country with persistent democracy throughout the years, i.e., with a polity score higher than 6 at each period.[6] The dataset hence contains a set of 36 countries, which all experienced a *polity* score below 6 at least once between 1980 and 2012.

Our fiscal decentralization variables come from the IMF's Fiscal Decentralization Database, a dataset commonly used to assess the contribution of subnational governments to both the revenue and expenditure functions of the general government.[7] In particular, this IMF dataset has allowed scholar to study the relationship between fiscal decentralization and governance (see e.g., Altunbaş and Thornton, 2012). To proxy for fiscal dependency at the local level, we first use IMF's $Transfer$ $Dependency$ 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 is defined in IMF's methodology as

$$Transfer\ Dependency \equiv \frac{Net\ transfers\ (received\ less\ paid)}{Local\ government's\ own\ revenue} \tag{1}$$

This index 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.

We also use the IMF's *Tax Revenue Decentralization* indicator, representing 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). The index is defined as:

$$Tax\ Revenue\ Decentralization \equiv \frac{Local\ tax\ revenue}{General\ Government\ tax\ revenue} \tag{2}$$

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[6]Source: Polity IV dataset version 2015. Countries categorized as *autocracies* have an index ranging between -10 to -6, *anocracies* are between -5 to +5, and *democracies* have an index between 6 and 10.

[7]Information on the IMF dataset provided in the Appendix, Section 11.1. One challenge we faced was to find accurate and reliable measures of tax system and fiscal federalism. 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. In our analysis, we look at two different IMF's measures of fiscal centralization levels: a transfer dependency index and a tax decentralization index.

This hence provides a measure of fiscal decentralization, as the index increases with the degree of fiscal autonomy at the sub-national level. Although a simultaneous increase in tax decentralization and a decrease in transfer dependency results in a higher fiscal decentralization, it is not excluded that both indicators move together. Indeed, they are not opposite by construction, and should be analyzed in parallel in order to comprehend fully the complex fiscal environment.

Different 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. 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.[8] 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.[9] 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.

The analysis also controls for the GDP per capita, population size and real effective exchange

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[8]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 11.1

[9]The *totciv* indicator represents the sum of all magnitude scores capturing the societal (i.e., civil and ethnic) MEPV scores for all neighboring states. More information in the Appendix, Section 11.1.

rates, from the *World Development Indicators* dataset (World Bank).[10] The objective of these control variables is to capture the size and relative economic openness of each country, 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 were particularly influential in the decentralization process. The summary statistics of the variables described above are shown in Table 1. A full description and links to the data is presented in the Appendix 11.1.

Table 1: Summary Statistics

Countries with a polity score ≤ 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
Population, total	962	397.27	1330.25	0.00	10389.94	0.28	1.80	99.87	1025.94
Real effective exchange rate (2010 = 100), in thousands	1066	69980.9	207781.9	1019.5	1350695	3069.6	5383.3	44641.5	144894

2.2 Correlations between political pressures 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.

$$Y_{i,t} \equiv \beta_0 \; + \; \beta_1 E_1(Polity)_{i,t} \; + \; \beta_2 E_1(Domestic)_{i,t} \; + \alpha_i + \mu_t + \; u_{i,t}^Y \qquad (3)$$

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,

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[10]The exact sources of the control variables are detailed in the Appendix, Section 11.1

for each variable $x = \{Polity, Domestic\ Instability\}$ one gets $E_1(x)_{i,t} = (x_{i,t} + x_{i,t-1})/2$. Moreover, the analysis accounts for the country's specificity through the fixed effects α_i. Indeed, fiscal decisions are context-specific and 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		
$E_1(Polity)$	0.195***	0.136***	0.143***	0.00384*	0.00538***	0.00503**
	(0.0518)	(0.0516)	(0.0515)	(0.00196)	(0.00197)	(0.00197)
$E_1(Domestic)$		-0.526***	-0.547***		0.0193***	0.0188***
		(0.122)	(0.122)		(0.00529)	(0.00527)
$E_1(Foreign)$			-0.125*			0.00469*
			(0.0674)			(0.00273)
Constant	-9.247***	-7.691***	-7.539***	-0.110	-0.143*	-0.165**
	(2.483)	(2.416)	(2.404)	(0.0790)	(0.0779)	(0.0787)
Observations	273	273	273	359	359	359
R-squared	0.886	0.895	0.896	0.828	0.835	0.837

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Regressions run with country and year fixed effects, controlling for 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. For instance, Martinez-Vazquez et al. (1997) laid out evidence from the literature that fiscal decentralization in several Latin America countries had helped to support existing democratic governance, by encouraging citizens' participation in local governance.

More interestingly 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.

We now introduce an additional independent variable, originating from the CSP dataset, that we labelled *Foreign Instability*. It represents the political pressures occurring in neighboring states and allows for political spillovers across countries, as seen in the democratization waves at the end of the Soviet union regime. This variable is not expected to be directly affected by national decentralization levels, and therefore provides a more exogenous measure of the democratic pressure faced by the regime. We now study the following regressions for each of our dependent variable.

$$Y_{i,t} \equiv \beta_0 \ + \ \beta_1 E_1(Polity)_{i,t} \ + \ \beta_2 E_1(Domestic)_{i,t} \ + \ \beta_3 E_1(Foreign)_{i,t} \ + \alpha_i + \mu_t + \ u_{i,t}^Y \qquad (4)$$

Results in columns (3) and (6) of Table 2 confirm that political instability in neighboring countries is associated with lower transfers dependency and higher tax autonomy at the sub national levels, although this is only significant at the 10 percent level. This result suggests that, even after controlling for domestic instability, democratic pressure from political instability in neighboring countries may push for greater fiscal decentralization in the home country. In the theory developed in section 3 we propose a causal explanation for these correlations.

2.3 Robustness

2.3.1 Z-score Standardization

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.[11] 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 :

$$Y_{i,t} = \beta_0 \ + \ \beta_1 E_1(Z.Polity)_{i,t} \ + \ \beta_2 E_1(Z.Domestic)_{i,t} \ + \ \beta_3 E_1(Z.Foreign)_{i,t} \ + \alpha_i + \mu_t + \ u_{i,t}^Y \ (5)$$

As can be seen in Table 3 in Appendix 11.2, using z-scores consistently reinforces our findings, as high domestic political instability over the last two years is associated with larger tax autonomy. In addition, there is evidence that foreign democracy pressure also pushes for fiscal decentralization, as coefficients for the foreign political pressure are statistically significant at the 10 and 5 percent level respectively. The coefficient increases in significance when using standardized units for the key independent variables.

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[11]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.

2.3.2 Testing different time lags

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 (Tables 6 and 7, in Appendix 11.3). The results are stronger when we include in the regression, in addition to recent measures of instability, those that are older. The coefficient on our variables of interest becomes more significant when we control for political pressure over a longer period.

2.3.3 Assuming delays between decision and implementation: removing current levels

Finally, the presence of current levels of democracy and instability in the regression equations could be questioned. If there is no time gap between political instability and fiscal change, the former is unlikely to explain decentralization. As can be seen in Appendix 11.4, previous results are robust to the exclusion of current levels of democracy and instability, with variation in the degree of significance. However, our model focuses on authoritarian regimes, which generally have the ability to make drastic decisions regarding fiscal transfers to regions and can change their fiscal policy quickly, without having to go through a lengthy legislative process. Therefore, we include current levels of democracy and political instabilities into the average values of our main regressions.

3 The model

We consider a country with two states/regions, $r = H, L$. 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: $n_H + n_L = 1$.[12] By assumption, the most populous state is L:

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[12] 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.

Assumption 1. $n_L \geq n_H$.

As in Besley and Coate (2003), there is a single private good, and two local public goods, one for each region. We generalize this framework by adding a national public good. Individuals differ in terms of their state of residence, and thereby in the level of local public resources available to them. That is, an individual in region r has access to $Q \geq 0$ units of the national public good, and $q_r \geq 0$ units of the local public good.[13] We assume that these publicly provided goods are complementary. The situation we have in mind is that of a national program for training teachers and local building for schools, a national highway and local roads to connect to it, etc. The per-capita level of public good available to a resident of region $r = \{H, L\}$ is :

$$g_r = \min\{q_r, Q\}. \tag{6}$$

Individuals' preference: As it is standard with public goods analysis, we assume that individuals preferences are separable between publicly provided goods and own purchases (i.e., preferences are quasi-linear). To be more specific, the utility of an individual from region $r = \{H, L\}$ with private consumption $x \geq 0$ and public good g_r is:

$$u(g_s, x) = \sqrt{g_s} + x. \tag{7}$$

The square-root assumption is not crucial to our results, but allows to get closed form solutions.[14] More importantly, our core results are robust to other utility functions, as shown in Appendix 10 where we consider an utility function of the Cobb-Douglas type. The quasi linear shape in (7) and the strict complementary between local and national public goods is not crucial to our results. They

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[13]In other words, Q and q_r are the per-capita levels of public goods available to each resident of region $r = \{H, L\}$. 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.

[14]The quasi-linear utility function is so that $u(g_s, x) = v(g_s) + x$, where $v(g)$ is an increasing, strictly concave function of $g \geq 0$. Here we simply set $v(g) = \sqrt{g}$.

hold in other models with sustainability.

Production function: While most papers on decentralization simply assume that the regions' gross revenue, and therefore the level of taxable income, are fixed, one contribution of the paper is to endogenize them. The private good is produced in both states with a constant return to scale technology. The inputs are labor, the net public good available locally g_r, and the local stock of capital a_r. For simplicity sake, we assume that the production function is Cobb-Douglas. Hence, the per capita production is:[15]

$$y_r = a_r(g_r)^{0.5} \tag{8}$$

Productivity is represented by a_r. 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): $a_H \geq a_L > 1$. The assumption can be written as:

Assumption 2. $\qquad\qquad \dfrac{a_H}{a_L} = k \geq 1 \quad and \quad a_L > 1.$

Last, the average national per capita production is defined as:[16]

$$y = n_H y_H + n_L y_L. \tag{9}$$

4 Public goods provision under centralization and decentralization

The country is composed of one central government, and two local governments (under decentralization). Public revenues originate from linear taxes levied on the private sector, and are used to

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[15]The per capita production function is easily obtained from the Cobb-Douglas production function $Y_r = a_r (G_r)^{0.5} (N_r)^{0.5}$, where inputs in the production process are labor N_r and the total level of public good $G_r = N_r g_r$. Dividing left and right by the population of region r, N_r, yields the result. One could also easily consider a more general production function $Y_r = a_r F (G_r, N_r)$, with the function F being a strictly increasing, concave function homogeneous of degree 1. The intuition of the results would be the same. Yet with $y_r = a_r F(g_r, 1) = a_r f(g_r)$ only implicit solutions would be derived.

[16]The private good national production is $Y = Y_H + Y_L = N_H y_H + N_L y_L$. Dividing by N yields (9).

finance the public goods.[17] The objective of this paper is to compare two fiscal regimes, centralized and decentralized. Our definition of such regimes follow Besley and Coate (2003). In decentralization, the national government collects taxes to finance the national public good, while local governments independently collect local taxes to finance their local public goods. Let t be the tax rate for national taxes, and τ_r the tax rate for local taxes, with $r = \{H, L\}$. In this scenario, the revenue levied to finance the local public good does not transit through the central government, therefore it cannot easily be diverted by the autocrat. When the regime is centralized, the central government collects all taxes and chooses how to allocate them between national and local public goods. We then consider two taxation rates, labelled t and τ, to finance the national and the local public good respectively, uniform across states.[18]

In the decentralization case, t is uniform across states but the taxation and decision about the local public good is decentralized at the state level. Region $r = \{H, L\}$ will set τ so that $\tau y_r = ty$, which yields $\tau_r(t) = \frac{ty}{y_r}$. By construction, region L is less productive than region H when holding the level of public good constant (since $a_H \geq a_L$), in other words $y_L \leq y_H$. We deduce that, under decentralization, $\tau_L = t\frac{y}{y_L} > \tau_H = t\frac{y}{y_H}$ and the local public good in each state perfectly complement the production of the national public good: $Q = q_H = q_L$.

Under centralization, the taxation rate to finance the local public good is uniform across states. Depending on which state $r = \{H, L\}$ has the power, the level of local public good will be determined by $\tau_r(t) = \frac{ty}{y_r}$. This assumption is consistent with the fact that information about local conditions is not known to the central government, which therefore applies uniform rules throughout the country. 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

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[17]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.

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

in a highly standardized manner, without regard to jurisdictional needs. If in region L holds power, then $\tau_L = t\frac{y}{y_L}$ so that $Q = q_L < q_H$. If power lies in state H, then $\tau_H = t\frac{y}{y_H}$ so that $Q = q_H > q_L$. When the richest state H has the power to set all taxes, it will choose a public good allocation that is inefficient for the poorest state L; indeed the level of local public good in state L is too small, and the poorest state would like to compensate its low productivity by a higher investment in local public good. Symmetrically, when the poor state has the decision-making power, it chooses a level of taxation for local public goods that is too high for the rich state. In other words, the state 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 state L when state H is in charged). As will be analyzed below, this loss of control over local fiscal revenues is a major obstacle to decentralization in autocracy.

One thus obtains the next result, whether the regime is democratic or autocratic.

Proposition 1. *When the regime is centralized and lies in H, then*

$$\frac{y_H}{y_L} = \left(\frac{a_H}{a_L}\right)^2 = k^2 \tag{10}$$

When the regime is either decentralized over local public goods, or centralized and lies in L, then

$$\frac{y_H}{y_L} = \frac{a_H}{a_L} = k \tag{11}$$

Proof See Appendix 9.1.

Assumption 2 returns that $k \geq 1$. Comparing equations (10) and (11), 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. In fact, the productivity gap between the two regions is the same when either

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centralization holds and the poor state chooses both local and national taxes, or when decentralization holds. Compared to an initial situation with a centralized government holding power in the rich state, as is common in autocracies, decentralization reduces productivity inequalities. Such reform therefore tend to favor the poorest region, by boosting its productivity.

5 Stable autocracy

In the initial situation, the regime is a stable autocracy, not expecting any political change. The autocrat belongs to the rich region H, and uses his power to extract a share b of the tax revenue T collected at the central level. The autocrats actually keeps a share $s \in [\frac{1}{N_H}, 1]$ of the bribes, and share equally the rest among agents of his supporters in region H. Through this patronage economy, the autocrats buys the support of the rich region in order to ensure political stability. Two extreme cases can be discussed: when $s = \frac{1}{N_H}$, the bribes are shared evenly between all citizen in H, while under $s = 1$ the autocrat is greedy and keeps everything for himself. The bribes' budget constraint is therefore: $bT = sbT + \frac{N_H}{N_H - 1}(1 - s)bT$. The utility of the autocrat is described as:

$$u_A(g_H, b) = \sqrt{g_H} + sbT \tag{12}$$

The autocrat is self-interested, and picks the option that maximizes the utility (12). For this, he chooses the taxes and the bribe rates, and whether to decentralize fiscal policies or not.

5.1 Centralized autocracy

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: $n_H q_H + n_L q_L + Q = (1 - b)(t + \tau)y$.

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As the autocrat belongs to the rich elite of region H, he sets $ty = \tau y_H$ so that the production of the local public good in state H perfectly complements the production of the national public good. For state L, the production of the national public good is deemed excessive compared to the production of its local public good.[19] As a result, the final gap in productivity between the two regions is $\frac{y_H}{y_L} = k^2$ (see Proposition 1), which is larger than the initial productivity gap $\frac{a_H}{a_L} = k$.

Next, the autocrat chooses b and t so as to maximize the utility function defined in (12).

Lemma 1. *Let $E(a^2) \equiv n_H a_H^2 + n_L a_L^2$. Under centralization the autocrat chooses the taxation rate*

$$t^c = 1 - \tau^c = \frac{a_H^2}{a_H^2 + E(a^2)} \tag{13}$$

and a bribe rate

$$b^c = \frac{1}{2}\left(1 - \frac{a_H}{sNE(a^2)}\right) \in (0, \frac{1}{2}), \tag{14}$$

so that

$$U_L^c < U_H^c \leq U_A^c. \tag{15}$$

Proof See Appendix 9.2.

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 (14) is smaller than one half.

Finally (15) 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 9.2, if the autocrat chooses to share the bribes equally with people in region H,

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[19]We have $q_H = (1-b)\tau y_H$ which perfectly complements $Q = (1-b)ty$. Therefore, $q_L = \frac{(1-b)ty}{y_H} y_L < Q = (1-b)ty$.

e.g., if he needs their maximum 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 $U_H^c < U_A^c$.

5.2 Decentralized autocracy

In the decentralization case, t is uniform across states but the taxation decisions on local public goods are decentralized at the state level. We deduce that $\tau_r(t) = \frac{ty}{y_r}$, which implies $\tau_H \leq \tau_L$. This imposes a constraint on the central government ability to tax the region L. To satisfy budget constraints, the central tax rate is such that $\tau_L \leq 1 - t$.

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

$$t^d = 1 - \tau_L^d = \frac{a_L}{a_L + Ea} \tag{16}$$

and a bribe rate

$$b^d = \frac{1}{2}\left(1 - \frac{a_L + Ea}{sN(1 + n_H)a_L Ea}\right) \in (0, \frac{1}{2}), \tag{17}$$

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

$$\frac{sN_H - 1}{s(N_H - 1)}\left(sN(n_H + 1) - \frac{a_L + Ea}{a_L Ea}\right) \geq 2(k - 1). \tag{18}$$

Proof See Appendix 9.3.

Under a decentralized regime, citizens in the rich region (autocrat included) have a higher utility than those in the poor region. By contrast, under decentralization, 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 the left hand side of (18) is equal to 0 and $U_H^d > U_A^d$. Agents in region H have

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the highest utility, followed by the autocrat, and next by agents in region L. Conversely, whenever the autocrat is greedy and keeps all the diverted taxes for himself (so that $s = 1$), then (18) is true if and only if $N + N_H > \frac{1}{a_L} + \frac{1}{Ea} + 2(k-1)$. Since $a_L > 1$ and $Ea > 1$, a sufficient condition for $U_A^d > U_H^d$ when $s = 1$ is $N + N_H > 2k$. This condition holds if the total population is large or the productivity gap between the two regions is not too large. By contrast if a_H is much larger than a_L (i.e., if k is very large) then one may have $U_A^d \le U_H^d$ even when $s = 1$.

The central taxation scheme t is set under the constraint that the total taxation rate is not larger than 1, i.e., what is taxed cannot be larger than what is produced. Since the region L invests more than region H in local public goods, the constraint is binding first in L. This implies that the autocrat abandons a rent to the people, which explains that, citizens of the rich region H can sometimes be better off than the autocrat himself. On the other hand, under a decentralized regime the autocrat is limited in his ability to extract rents from the people.

This result suggests that the autocrat might in many cases prefer the centralized regime to decentralization. The latter regime is more efficient in term of total national production, but forces the autocrat to lose control over a fraction of the taxes. There is therefore a trade-off between efficiency and rent extraction, that we will now explore further.[20]

5.3   Comparison of regimes

Comparing results from Lemma 1 and 2, we show in Appendix 9.4 that $t^c \ge t^d$. In addition, $b^c \ge b^d$ whenever either $k \ge \frac{\sqrt{n_L}}{1-n_L}$ or n_L is relatively small (i.e. it is close to 0.5). The bribe rate is then higher under a centralized regime than under a decentralized one. By contrast, when n_L converges to 1, one gets that $b^c \ge b^d$ if and only if $k \le 2$. By virtue of Proposition 1, the centralized regime returns the highest productivity gap between the two regions (compared to decentralization). It also

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[20]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).

yields the highest level of capture by the autocrat, whenever regions are not too unequal in terms of population size, or whenever the productivity gap between the two regions is large enough.[21]

The autocrat hence compares both regimes and picks the one that maximize his utility, following Proposition 2.

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

$$\left[\frac{1 + sNa_H \left(n_H + \frac{n_L}{k^2} \right)}{1 + sNa_H(n_H + \frac{n_L}{k})\frac{1+n_H}{1+n_Hk+n_L}} \right]^2 \geq 1 + \frac{n_L}{(1+n_H)k^2} \tag{19}$$

Proof: See Appendix 9.5.

There exist many situations such that condition (19) holds. For instance, if $k \to 1$ then condition (19) is equivalent to $a_H sN \geq \sqrt{\frac{2}{1+n_H}}$, which is always true under our assumptions.[22] In other words, if the productivity gap between the two regions is small, the autocrat will pick centralization over decentralization. In this case, the inefficiency cost of a centralized regime is manageable, because both regions are similar. The autocrat therefore chooses the centralized regime as it maximizes his bribes. Similarly, we show in Appendix 9.5 that if k is sufficiently large then condition (19) always holds. To see this result, it is sufficient to look at the limit case where $k \to +\infty$. The left hand side of equation (19) goes to infinity, while the right hand side converge to 1. By continuity, the result still holds for large finite value of k. 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.

Conversely, there are cases under which (19) is violated. For instance, we show in the Appendix

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[21]The theory does not lead to any firm result on which regime maximizes the corruption rent, and whether $b^c \geq b^d$ would hence be an interesting empirical question.

[22]When $k \to 1$ condition (19) is equivalent to $(1 + a_H sN)^2 \geq \frac{2}{1+n_H} \left(1 + a_H sN(\frac{1+n_H}{2}) \right)^2$, which simplifies into $a_H sN \geq \sqrt{\frac{2}{1+n_H}}$. The Right Hand Side (RHS) increases in $s \in [\frac{1}{N_H}, 1]$. If it is true at $s = \frac{1}{N_H}$ it is always true. Since $a_H > 1$ a sufficient condition for the inequality to hold is $1 + n_H > 2n_H^2$ which is always true for all $n_H \in [0,1]$.

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9.5 that if n_H is very small (i.e., converge to 0), then equation (19) does not hold for all finite $k > \sqrt{3}$, and the autocrat prefers decentralization over centralization. We also find that the bribe rate is higher under decentralization (see Appendix 9.4). When the only source of revenue for the autocrat comes from the poor region, he maximizes the productivity in this region through decentralization, and captures its revenue through national taxes. 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. More generally, equation (19) does not hold whenever the left hand side of the equation is lower than 1, which is equivalent to $n_L(k - 1 - n_L) \geq n_H k^2(n_H(k-1) + n_L)$. For instance, if $k = 3$ then this condition is equivalent to $n_L \geq 0.9$ (or equivalently $n_H = 1 - n_L \leq 0.1$).

So far we have considered the situation of a stable autocracy. Yet, a wave of democratic reforms has been sweeping throughout the world since the end of the Cold War. 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. In what follows, we study what would be the outcome of the transition to democracy for the autocrat who anticipates it. Assuming he is not fighting it with violence but is accommodating it, the autocrat can organize his future demised to his advantage. He may step down on his own term, so that the transition is relatively smooth and peaceful. Such transitions occurred in many autocratic countries when their rulers came to realize that the transition was inevitable (e.g., in former USSR, in Chile, in Paraguay).

6 Transition to democracy

If the country makes the transition to democracy, identified by a star (*), the median voter chooses both the taxation rates and the fiscal regime, i.e., whether to implement decentralization reforms or not. This corresponds to the outcome that will prevail with a direct presidential regime. We can

therefore compare easily the equilibrium outcome in democracy with the outcome in the autocratic case. Under democracy, the decisions will be taken by citizens in region L, as it is the most populous region (assumption A1). We implicitly 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 in democracy is, for instance, attested by Genicot et al. (2021) in the American context. We find that the representative agent of region L is indifferent between centralization and decentralization. As shown in appendix 10 in Proposition 5, the result holds even if the preferences of the voters are Cobb-Douglas. This result, which is fairly robust, is key to our analysis.

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

$$U_L^{d*} = U_L^{c*} = \frac{(a_L + 1)^2}{4} \frac{Ea}{a_L + Ea} \tag{20}$$

Proof: See Appendix 9.6.

The representative citizen of state L is indifferent between centralization and decentralization when the decision power lies in L. Conversely, citizen in H do care about the fiscal regime in place. As shown in Appendix 9.6, the utility of the representative citizen of region H in the centralization case is

$$U_H^{c*} = \left(1 + \frac{(k-1)(a_L - 1)}{a_L + 1}\right) U_L^{c*}. \tag{21}$$

Since $k \geq 1$ and $a_L > 1$, comparing (20) and (21) 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 the representative citizen of state H and L do decrease with

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the transition to democracy. That is,

$$\frac{U_H^{c*}}{U_L^{c*}} \leq \frac{U_H^c}{U_L^c} \qquad (22)$$

Similarly, we show in Appendix 9.7 that the utility of the representative citizen of region H in the decentralization case is

$$U_H^{d*} = \left(1 + \frac{a_L(k-1)}{a_L + 1} \frac{2Ea + a_L - 1}{a_L + Ea}\right) U_L^{d*} \qquad (23)$$

Comparing (21) and (23), we can now establish our main decentralization result, which is a corollary of Proposition 3. As shown in Proposition 5 of Appendix 10, this result holds when the preferences of the voters are Cobb-Douglas.

Corollary 1. *If the autocrat in state H anticipates the transition to democracy whereby L will be in power, he will prefer to implement decentralization ahead of democratization reform, since*

$$U_H^{d*} \geq U_H^{c*}. \qquad (24)$$

Proof See Appendix 9.8.

By virtue of Proposition 3, the median voter in region L has no incentive to decentralize, as it would not increase his welfare.[23] Remembering that, under democracy, citizens in H would prefer decentralization, an autocrat who anticipates a transition to democracy should therefore go ahead and implement decentralization before the regime change.

Corollary 1 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, likely to

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[23]In practice the reform is costly to implement. Adding a fixed cost to implement the reform of decentralization would deter the median voter of region L to implement a costly reform he will not benefit from.

reside in a poorer state. An autocratic regime which foresees a change of regime towards democracy has incentives to implement decentralization before the transition. Indeed, decentralization leaves more latitude to optimize public investment to meet the elite needs and to protect their wealth from taxation by the poor region.

7 Strategic decentralization

So far we have considered a case where a future democratic transition was certain. Yet, in practice these events are rarely set in stone, and are subjected to probabilities. In what follows, we consider how our results are affected by that uncertainty.

7.1 Exogenous transition to democracy

Throughout history, there exist examples of external forces and events that might foster the transition to democracy, such as the end of the Cold War or a revolution in neighbor countries. In this section, we focus on situation where the probability to undergo a future democracy is exogenous.

When the autocratic state is centralized, the dictator stays in power with probability α_c, while a revolution occurs with probability $1 - \alpha_c$. When decentralization reforms are implemented at the beginning of the period, the dictator stays in power with probability α_d, and is thrown away 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.[24] Under democracy, the autocrat has no power and gets the utility of a representative citizen of state H, minus a sanction cost $K^r \geq 0$ ($r = c, d$), which might depend on how peaceful the transition to democracy has been.

In a context of civil instability, $\gamma \equiv \alpha_d - \alpha_c$ therefore represents the *strategic effect* of decentralization, i.e., the impact of a decentralization reform as a political move to prevent rebellion. Whenever $\gamma > 0$, decentralization allows the regime to stay in power with a larger probability than centralization.

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[24]This comes from $n_L > n_H$.

By contrast, decentralization is an accelerator of democratization whenever $\gamma < 0$, and it is neutral whenever $\gamma = 0$.

We now turn to study the optimal decentralization policy from the autocrat point of view. If the fiscal regime is centralized, the dictator gets an expected utility of

$$V_A^c \quad = \quad \alpha_c U_A^c + (1 - \alpha_c)(U_H^{c*} - K^c) \tag{25}$$

If the regime is decentralized, the dictator gets an expected utility of

$$V_A^d \quad = \quad \alpha_d U_A^d + (1 - \alpha_d)(U_H^{d*} - K^d) \tag{26}$$

$$= \quad \alpha_c U_A^d + (1 - \alpha_c)(U_H^{d*} - K^d) + \gamma(U_A^d - U_H^{d*} + K^d) \tag{27}$$

Let $\Delta K \equiv K^c - K^d$ be the difference of penalty faced by the autocrat in a centralized versus decentralized regime, once democracy is in place. The autocrat will choose decentralization whenever $V_A^d - V_A^c > 0$, which is equivalent to

$$0 \quad < \quad \alpha_c \left[U_A^d - U_A^c \right] + (1 - \alpha_c) \underbrace{\left[U_H^{d*} - U_H^{c*} \right]}_{\geq 0} + (1 - \alpha_c)\Delta K + \gamma \left[U_A^d - U_H^{d*} + K^d \right] \tag{28}$$

The dictator sets his optimal decentralization reform based on several dimensions:

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

- $U_H^{d*} - U_H^{c*}$ represents the gain of any agent H from being in a decentralized state (versus centralized) under democracy. As shown in (24), it is always positive.

- $\Delta K = K^c - K^d$ represents the relative cost of sanctions in case of transition to democracy.

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

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populist reform.

The result of Corollary 1 can be obtained by setting $K^c = K^d$ and $\alpha_c = \alpha_d = 0$ (and therefore $\gamma = 0$) in equation (28). 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. By contrast, if the autocracy is extremely stable ($\alpha_c = \alpha_d = 1$ and therefore $\gamma = 0$), the result of Proposition 2 holds, and the autocrat implements decentralization if and only if inequality (19) is true.

7.2 Endogenous transition to democracy

Let's now look at situations whereby the democratization process is endogenous, that is, whenever the autocrat's fiscal policies can affect social unrest and popular uprisings. 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 $Ea = n_L + n_H k$. This implies that

$$U^* = U_L^{d*} = U_L^{c*} = U_H^{c*} = \frac{Ea}{1 + Ea} < U_H^{d*} = \frac{1 + kEa}{1 + Ea} U_H^{c*}. \tag{29}$$

The probability that the autocrat is overthrown depends on the probability that the poor region rebels and wins the contest. There are indeed 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.

To be more specific, 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). 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 $\underline{u} \sim U[0, U^*]$. The minimum utility required by the poor region is bounded upward by $U_L^{c*} = U_L^{d*} = U^*$, the utility of a representative poor citizen in democracy. We deduce that, in the centralized case, the probability that the poor region rebels is $1 - P(\underline{u} \leq U_L^c) = 1 - \frac{U_L^c}{U_L^{c*}}$. Should it rebel, the poor region's ability to win depends on the relative amount of resources it can throw in the battle,

compared to the amount of resources available in the rich region. 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). By virtue of Proposition 1, the probability that the poor region wins the contest is higher with decentralization: $\frac{n_L}{n_H k + n_L} \geq \frac{n_L}{n_H k^2 + n_L}$. Indeed the autocrat has relatively more power to fight a rebellion in the case of centralization because the productivity gap between the two region (defined by k^2) is higher than with decentralization (where it equals k).

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

$$\alpha_c = \frac{U_L^c}{U_L^{c*}} + \frac{n_H k^2}{n_H k^2 + n_L} \left(1 - \frac{U_L^c}{U_L^{c*}} \right) \in (0, 1). \tag{30}$$

This probability α_c 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).

In order to illustrate the strategic component of fiscal decisions, we study a centralized scheme under which citizens of region H prefer the autocracy and have no interest to rebel.

Assumption 3. $\qquad 2\,\dfrac{n_H + 1}{n_H} \leq k$

As shown in Appendix 9.10, assumption 3 ensures that $U_H^{c*} < U_H^c$. The region L has a relative low productivity compared to region H, which is at least twice more productive. Citizens of the rich region are better off under a centralized autocracy than under a centralized democracy, and they will support the autocrat in his decision to maintain centralization.[25] Under assumption 3, the probability that the autocrat is overthrown hence depends on the probability that the poor region rebels and wins the contest.[26]

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[25] By virtue of Proposition 3, citizens in H will be stuck in this unwanted regime in the case to a violent transition to democracy.

[26] We have for instance already established that the utility of the representative agent in state L under an autocratic regime is higher under the decentralized regime than under the centralized one.

Now in case of decentralization, under the assumptions that $N \to +\infty$ and $a_L = 1$, it is shown in Appendix 9.9 that

$$U_H^d < U_H^{d*} \tag{31}$$

When the fiscal regime is decentralized, citizens of the rich region H would prefer democracy in order to avoid the too large inefficiency imposed by the corrupted autocrat. In the case of decentralization, the autocrat looses all his support and therefore stays in power with probability

$$\alpha_d = 0. \tag{32}$$

Under the assumptions of this section, decentralization is therefore an accelerator of the democratization process, with $\gamma = -\alpha^c < 0$. In this case the autocrat will first decentralize and then step down peacefully to allow a democratic transition. It implies that, whenever he chooses decentralization the autocrat does not suffer the penalty K of a violent transition.

Substituting this value of γ in equation (28), the autocrat decentralizes when $V_A^d - V_A^c > 0$, which is equivalent to

$$(1 - \alpha_c) \left[U_H^{c*} - K^c \right] + \alpha_c U_A^c < U_H^{d*} - K^d \tag{33}$$

where α^c is solution of (30). Whenever (33) holds, the autocrat chooses to implement first decentralization and then a peaceful transition to democracy, because keeping the regime centralized and autocratic is too costly. When (33) does not hold, he clings to power and does not decentralize. This implies that social unrest and popular rebellion occur in the region L, and if the popular rebellion succeeds, a violent transition to centralized democracy takes place. Both scenario are possible depending on the values of the parameters. To be more specific, using (29) and (33), the dictator chooses

decentralization if and only if

$$\alpha_c \left(U_A^c - U_H^{c*} + K^c \right) \quad < \quad (k-1) \frac{Ea}{1+Ea} U_H^{c*} + \Delta K \tag{34}$$

We deduce the next proposition.

Proposition 4. *Let $N \to +\infty$, $a_L = 1$ and $a_H = k > 2(1 + \frac{1}{n_H})$. There exists a range of parameters such that if the autocrat shares equally his rents between his followers of region H (by setting $s = \frac{1}{N_H}$), 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 □

In very large countries, a greedy autocrat diverts huge bribes by siphoning parts of the total country production.[27] Since $n_L > \frac{1}{2}$ it is easy to see that the probability α_c is always strictly positive. Therefore, there exists no probability of revolution $(1 - \alpha_c)$ high enough such that the autocrat's expected revenue under centralized autocracy is smaller than under democracy. In this case he will cling to power, even if it leads to a civil war.

Now if the autocrat heavily redistributes (with $s = \frac{1}{N_H}$), decentralization and a peaceful transition to democracy will occur if (34) holds. This is more likely whenever the penalty for a violent transition K^c is large enough and the transition for a peaceful transition under decentralization K^d is low enough. Decentralization and a peaceful transition to democracy is also more likely when the productivity gap k is large enough and when n_H the number of citizens in region H is small enough.

The analysis above reveals the importance of the punishment endured by the autocrat when he steps down voluntarily from power, compared to the punishment in case of a violent transition to

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[27]When $s > \frac{1}{N_H}$ equation (39) implies that $\lim_{N \to +\infty} U_A^c = +\infty$. See the proof in the Appendix 9.11.

democracy. When the dictator anticipates a harsh punishment during a transition to democracy, for instance being executed after democratization ($K^d \to +\infty$), he will cling to power through a centralized system, since decentralization would trigger democratization and his demise. By contrast, if the sanctions are differentiated based on how the transition to democracy occurs, then sanctions can become a useful tool to favor a peaceful transition to democracy. This could for instance be the case if $K^d = 0$ when the autocrat steps down voluntarily, and $K^c \to \infty$, when he clings to his centralized power. This result is intuitive: if the autocrat faces substantial sanctions whenever he resists any regime change by engaging in a violent transition, this encourages him to step down more easily. In contrast, if K^d is low the autocrat will implement decentralization and step down. These important insights highlight the importance of providing warranties to the autocrat that he will not be harmed should he accepts the democratic transition, hence making the difference in actual sanctions costs credible.

8   Conclusion

The paper studied the conditions under which it is rational for an autocrat to launch decentralization reforms, i.e. delegate to subnational governments the tax collection and spending decisions on local public goods. Decentralization reforms can be the optimal decisions both when the regime is stable or under threat of democratization. Under autocracy, the ruler faces a trade-off between rents extraction, which is easier under centralization, and productivity, which is maximized by decentralization. In stable autocracies, there exist cases where the latter effect dominates. When the inefficiencies generated by a centralized system are substantially large, they limit the country wealth and by the same token the autocrats' ability to extract revenue. This is typically the case when the rich region is small in size compared to the poor region. Decentralization is implemented to boost productivity

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in the poor region and hence maximize the surplus of the autocrat and his ruling clique. By contrast when the inefficiency cost of centralization is relatively small, for instance because the productivity gap between the two regions is not too large, the autocrat favors centralization.

In unstable autocracies, decentralization is even more likely to be implemented, provided that the autocrat does not fear to be sanctioned too harshly in case of a democratic transition. An autocrat who anticipates a (peaceful) democratic transition will decentralize ahead of the reforms in order to protect the rent of the elite. Indeed, if the national median voter, who leaves in the poor region, is given power through democratization reforms, she will have little incentive to implement decentralization reforms because she has nothing to win from such reforms. Our analysis shows that in democracy her utility is the same under centralization and decentralization. By contrast, in democracy, the welfare of the representative agent of the rich region is higher under decentralization than under centralization. Instability and the prospect of democratization favor decentralization to ensure greater utility for the elite in the event of a takeover by the poor region.

To illustrate the relevance of our analysis we have assembled a panel data set. Excluding pure democracies from our sample, we investigate whether political domestic and foreign instability influence fiscal reforms. We find that domestic social unrest, and to a lesser extent foreign social unrest, tend to lead to lower national transfer dependency and higher local tax revenue, two measures of decentralization. These findings are robust to various measures of time lag and controls. They suggest that democratization pressure and instability in autocracies tend to favor decentralization.

Finally, in unstable autocracies one needs to account for the strategical aspect of fiscal reforms. It has been stressed by political scientists and economists that decentralization reforms could influence the probability of a rebellion in opposite directions. By devolving power, it could reduce the grievance of the people and their willingness to rebel. In this sense decentralization reforms could be used by authoritative governments to stall the transition to democracy. On the other hand, by increasing the

autonomy of the poor region, decentralization affects positively the probability that a rebellion would be successful. We have shown that in large countries fiscal decentralization makes democracy more appealing to citizens in the rich region, as the corrupt autocrat imposes a too high inefficiency loss on the country. In such context, decentralization is unlikely to be implemented when the autocrat's sanction cost of losing power is very large (e.g. if he anticipates to be executed should L be in power).

The analysis demonstrates how the decentralization process is influenced by $i)$ rents extraction, which is higher under centralization, everything else being equal, $ii)$ the increase in productivity in the poor region following decentralization and $iii)$ the strategic effects that decentralization reforms have on the probability of popular unrest. This also helps explaining why empirical studies find conflicting or inconclusive evidence on the impact of decentralization on various economic and welfare indicators. Indeed, decentralization reforms are complex and their causes and consequences vary according to the political context and the stragetical environment faced by the government.

To go further, one could 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 local states. Hence, some forms of decentralization might allow the central state to maintain control over the regions, and could then be strategically advantageous for dictatorships, as advocated by Parry (1997), Chanie (2007) or Keller (2002).

Another simplification made to facilitate the comparison between autocracies and democracies is that in the transition to democracy the median voter rules. This corresponds to a direct presidential democracy, which leaves aside the rich and complex choice of electoral rules in democracy. Interesting new results could be gathered by exploring equilibrium outcome that would prevail with a parliamentary regime. In this case the nature of the electoral system, majoritarian or proportional representation, would influence government interventions and the level of inequalities between localities as shown by Genicot et al. (2021). We leave these interesting topics for further research.

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9 Appendix

9.1 Proof of Proposition 1

In the centralized case the private sector is taxed uniformly throughout the country.[28] Therefore the productivity gap between the two regions is higher when power lies in the rich region H than in the poor region L.

When region H has the power, it sets $q_H = Q$, leading to $\tau = \frac{ty}{y_H}$, and $y_H = a_H \left((1-b)Q\right)^{0.5}$. By virtue of the property of the minimum function $y_L = a_L \left((1-b)min\{Q, q_L\}\right)^{0.5} \leq a_L \left((1-b)Q\right)^{0.5} < y_H$ 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 state H: $g_L = \frac{y_L}{y_H}ty(1-b) < g_H = ty(1-b)$. We deduce that the per-capita production level in the two regions is $y_H = a_H \left((1-b)ty\right)^{0.5}$ and $y_L = a_L(1-b)^{0.5} \left(\min\{ty, \frac{y_L}{y_H}ty\}\right)^{0.5} = a_L(1-b)^{0.5} \left(\frac{y_L}{y_H}ty\right)^{0.5}$ so that $\frac{y_H}{y_L} = \left(\frac{a_H}{a_L}\right)^2$.

When the power lies in L then $ty = \tau y_L$ so that the production of the local public good in region L, $q_L = \tau y_L$, perfectly complements the production of the national public good $Q = ty$. This implies for region H that the production of the national public good is insufficient compared to its production of the local public good: $q_H = \frac{ty}{y_L}y_H > Q = ty$. We deduce that $y_r = a_r \left((1-b)ty\right)^{0.5}$ so that $\frac{y_H}{y_L} = \frac{a_H}{a_L}$.

In the decentralized case, each region adapts freely its level of local public good. That is, $q_r = (1-b)\tau_r y_r$, perfectly complement $Q = (1-b)ty$, both for H and L. If the power to fix t is in region H, the government (autocratic or democratic) chooses t such that $ty = \tau_H y_H$, therefore $y_H = a_H\sqrt{(1-b)ty}$ and state L implements $\tau_L = t\frac{y}{y_L} > \tau_H > t$ so that $y_L = a_L\sqrt{(1-b)ty}$.

If the power to fix t is in region L, the government (autocratic or democratic) chooses t such

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[28]It is equivalent to consider a uniform tax rate and an allocation rule of this tax revenue $l \in [0,1]$ between global $Q = (1-l)Ty$ and local $q_r = lTy_r$ public good or two taxation rates t and τ uniform across states so that $Q = ty$ while $q_r = \tau y_r$. The tax revenue is Ty. It is spread on a per capita basis according to the sharing rule $l \in [0,1]$ between local public good $n_r q_r = lTn_r y_r$ and national public good $Q = (1-l)Ty$. By construction the budget is balanced: $n_H q_H + n_L q_L = lTy$ and $Q = (1-l)Ty$ so that $n_H q_H + n_L q_L + Q = Ty$.

that $ty = \tau_L y_L$, therefore $y_L = a_L \sqrt{(1-b)ty}$ and state H implements $\tau_H = t\frac{y}{y_H} < \tau_L$ so that $y_H = a_H \sqrt{(1-b)ty}$. We deduce that, whether the regime is democratic or autocratic, when power over local public goods is decentralized then $\frac{y_H}{y_L} = \frac{a_H}{a_L}$.

Since by Assumption 2 we have $k \geq 1$, comparing (10) and (11) yields $\frac{a_H}{a_L} = k < \left(\frac{a_H}{a_L}\right)^2 = k^2$.

9.2   Proof of Lemma 1

Equation (10) implies that $y = y_H(n_H + n_L\left(\frac{a_L}{a_H}\right)^2)$. Substituting this expression into $y_H = a_H\left((1-b)ty\right)^{0.5}$ returns after simplification $y_H = \sqrt{(1-b)t\left(n_H a_H^2 + n_L a_L^2\right)y_H}$. Let $E(a^2) \equiv n_H a_H^2 + n_L a_L^2$. We deduce that $y_H = (1-b)tE(a^2)$ so that $y_L = \left(\frac{a_L}{a_H}\right)^2 (1-b)tE(a^2)$ and that $Q = q_H = \left((1-b)t\frac{E(a^2)}{a_H}\right)^2$.

The autocrat chooses b and t so as to maximize the utility function defined in (12) where the private consumption is $sbNy(t+\tau) = sbNy(t+\frac{ty}{y_H}) = sbNyt\left(\frac{a_H^2 + E(a^2)}{a_H^2}\right)$. He solves his maximization function under the constraint that $1 - t - \tau = 1 - t\left(\frac{a_H^2 + E(a^2)}{a_H^2}\right) \geq 0$ and $0 \leq b \leq 1$:

$$\max_t U_A^c = (1-b)t\frac{E(a^2)}{a_H} + (1-b)bsN\frac{t^2 E(a^2)^2}{a_H^2}\left(\frac{a_H^2 + E(a^2)}{a_H^2}\right) \tag{35}$$

It is easy to check that, 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 following tax constraint

$$t^c = 1 - \tau^c = \frac{a_H^2}{a_H^2 + E(a^2)} \tag{36}$$

Substituting t^c by its value from (36) in the autocrat utility function (35) yields

$$U_A^c = \frac{E(a^2)}{a_H^2 + E(a^2)}\left((1-b)a_H + (1-b)bsNE(a^2)\right) \tag{37}$$

It is easy to check that the utility is concave in b. The optimal bribe rate for the autocrat in a

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centralized regime is then

$$b^c = \frac{1}{2}\left(1 - \frac{a_H}{sNE(a^2)}\right) \in \left(0, \frac{1}{2}\right) \tag{38}$$

since $s \in [\frac{1}{N_H}, 1]$.

The autocrat's utility under centralized regime is therefore given by

$$U_A^c = \frac{(sNE(a^2) + a_H)^2}{4sN(a_H^2 + E(a^2))} \tag{39}$$

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

$$U_H^c = \sqrt{q_H} + \frac{(1-s)b^cT^c}{N_H - 1} \tag{40}$$

$$= (1 - b^c)\frac{E(a^2)}{a_H^2 + E(a^2)}\left(a_H + b^c\frac{(1-s)N}{N_H - 1}E(a^2)\right) \tag{41}$$

$$= \frac{a_H + sNE(a^2)}{2sN(a_H^2 + E(a^2))}\left(a_H + (1-s)\frac{sNE(a^2) - a_H}{2s(N_H - 1)}\right) \tag{42}$$

The utility of a representative agent of region L is

$$U_L^c = \sqrt{q_L} = \frac{a_L}{a_H}(1 - b^c)t_A^c\frac{E(a^2)}{a_H} = \frac{a_H + sNE(a^2)}{2sN(a_H^2 + E(a^2))}a_L. \tag{43}$$

We deduce that

$$U_H^c = \left(k + \frac{1-s}{s(N_H - 1)}\frac{(sN_Ha_H - 1)k + sN_La_L}{2}\right)U_L^c \tag{44}$$

Finally the autocrat utility function is

$$U_A^c = \left(k + \frac{(sN_Ha_H - 1)k + sN_La_L}{2}\right)U_L^c \tag{45}$$

Comparing equations (43), (44) and (45), it is straightforward to check that, since $s \in [\frac{1}{N_H}, 1]$, $N_H \geq 1$,

$k \geq 1$ and $a_H > a_L > 1$, we have $U_L^c < U_H^c \leq U_A^c$.

9.3 Proof of Lemma 2

Under decentralization the autocrat captures $bT^d = b(tY + \tau_H Y_H)$. Since $\tau_H y_H = ty$, the rent extracted by the autocrat is $bT^d = bNty(1 + n_H)$. Let $Ea \equiv n_H a_H + n_L a_L$. Equation (11) implies that $y = \frac{Ea}{a_H} y_H$. Substituting this expression in $y_H = a_H \sqrt{(1-b)ty}$ we deduce that $y_H = (1-b)ta_H Ea$ so that $y_L = (1-b)ta_L Ea$ and that $y = (1-b)(Ea)^2 t$. This implies $Q = q_H = q_L = (1-b)^2 t^2 (Ea)^2$ and $g_H = g_L = (1-b)^2 t^2 (Ea)^2$.

The autocrat chooses b and t so as to maximize the utility function defined in (12) where his public good consumption is $g_H = (1-b)^2 t^2 (Ea)^2$ and his private consumption is $sbT^d = sb(1-b)t^2(Ea)^2(1+n_H)N$. Since $\tau_L = k\tau_H > \tau_H = (n_H + \frac{n_L}{k})t$, he solves his utility constraint under the constraint that $1 - t - \tau_L = 1 - \left(1 + \frac{Ea}{a_L}\right)t \geq 0$, which is

$$\max_t U_A^d \quad = \quad (1-b)tEa\left[1 + sbtEaN(1 + n_H)\right] \tag{46}$$

Since equation (46) is strictly increasing in t, the autocrat chooses the maximum tax level that satisfies the tax constraints for both region. Since $\tau_H \leq \tau_L = \frac{ty}{y_L}$, the tax constraint is binding for the poor region, and

$$t^d = 1 - \tau_L^d = \frac{a_L}{a_L + Ea} \tag{47}$$

Substituting t^d in (46) the autocrat next chooses b so as to maximize the following utility function

$$\max_b U_A^d \quad = \quad \frac{a_L Ea}{a_L + Ea}(1-b)\left[1 + sb\frac{a_L Ea}{a_L + Ea}N(1 + n_H)\right] \tag{48}$$

It is easy to check that the utility function is strictly concave in b. The optimal bribe rate is given by

$$b^d = \frac{1}{2}\left(1 - \frac{a_L + Ea}{a_L Ea(1 + n_H)sN}\right) \in \left(0, \frac{1}{2}\right) \tag{49}$$

Substituting b^d in equation (48) the autocrat's utility level under a decentralized regime is then given by

$$U_A^d = \frac{sN(1+n_H)}{4}\left[\frac{a_L Ea}{a_L + Ea} + \frac{1}{sN(1+n_H)}\right]^2 \tag{50}$$

Similarly the utility of a representative agent of region L is

$$U_L^d = \sqrt{Q} = \frac{1}{2}\left[\frac{a_L Ea}{a_L + Ea} + \frac{1}{sN(1+n_H)}\right] \tag{51}$$

We deduce that the autocrats utility level under a decentralized regime is

$$U_A^d = \left(1 + \frac{sN(n_H+1)a_L Ea - a_L - Ea}{2(a_L + Ea)}\right)U_L^d \tag{52}$$

$$\geq \left(1 + \frac{(1+\frac{1}{n_H})a_L Ea - a_L - Ea}{2(a_L + Ea)}\right)U_L^d \tag{53}$$

since $s \geq \frac{1}{N_H}$. Under our assumptions $n_H < 1$ and $1 < a_L \leq Ea$, we find that $U_A^d > U_L^d$.

Finally the utility of a representative agent of region H is

$$
\begin{aligned}
U_H^d &= \sqrt{Q} + (1 - t^d - \tau_H^d)y_H + \frac{(1-s)N(1+n_H)}{N_H - 1}\left(\frac{a_L Ea}{a_L + Ea}\right)^2(1-b^d)b^d \\
&= \frac{1}{2}\left[\frac{a_L Ea}{a_L + Ea} + \frac{1}{sN(1+n_H)}\right]\left[1 + \frac{(a_H - a_L)Ea}{a_L + Ea} + \frac{1-s}{2s(N_H - 1)}\left(\frac{a_L EasN(1+n_H)}{a_L + Ea} - 1\right)\right] \\
&= U_L^d\left[1 + \frac{(k-1)a_L Ea}{a_L + Ea} + \frac{1-s}{2s(N_H - 1)}\left(\frac{a_L EasN(1+n_H)}{a_L + Ea} - 1\right)\right]
\end{aligned}
\tag{54}
$$

Comparing equations (51) and (54), it is straightforward to check that $U_L^d \leq U_H^d$, since $k \geq 1$ and $s \in [\frac{1}{N_H}, 1]$. By contrast, comparing equations (54) and (52), 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, one gets $U_A^d > U_H^d$ if and only if

$$\frac{sN_H - 1}{s(N_H - 1)}\left(sN(n_H + 1) - \frac{a_L + Ea}{a_L Ea}\right) \geq 2(k-1) \tag{55}$$

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When $s = \frac{1}{N_H}$, the Left Hand Side (LHS) of the inequality is 0 so that equation (55) does not hold. When at the other extreme we have $s = 1$, then equation (55) is true if and only if $(N + N_H)a_L Ea - a_L - Ea > 2(k-1)a_L Ea$. Dividing left and right by $a_L Ea$ and rearranging it, this condition boils down to $N + N_H > \frac{1}{a_L} + \frac{1}{Ea} + 2(k-1)$.

9.4   Taxes and bribes in centralized and decentralized autocracies

Comparing equations (13) and (16), we want to show that $t_A^c \geq t_A^d$, which is equivalent to

$$a_H^2(a_L + Ea) \geq a_L(a_H^2 + E(a^2)) \tag{56}$$

Simplifying the equation left and right by $a_H^2 a_L$, one gets $a_H^2 Ea \geq a_L E(a^2)$. Let $a_H = ka_L$ with $k \geq 1$. Condition (56) is equivalent to

$$\frac{Ea}{a_L} = n_L + n_H k \geq \frac{n_L}{k^2} + n_H = \frac{E(a^2)}{a_H^2} \tag{57}$$

This is equivalent to

$$k^2(n_L - n_H) + n_H k^3 - n_L \geq 0. \tag{58}$$

Since $n_L - n_H \geq 0$ and $n_H > 0$, it is easy to check that the LHS is strictly increasing with $k \geq 1$. Therefore, equation (58) always holds since it holds with equality at $k = 1$.

We now turn to the comparison of bribe rates. Comparing equations (14) and (17), we want to find the conditions under which $b^c \geq b^d$, which is

$$\frac{1}{2}\left(1 - \frac{a_H}{sNE(a^2)}\right) \geq \frac{1}{2}\left(1 - \frac{a_L + Ea}{sN(1 + n_H)a_L Ea}\right) \tag{59}$$

This is equivalent to

$$(1 + n_H)a_L a_H Ea \leq (a_L + Ea)E(a^2). \tag{60}$$

Recall that $Ea = n_H a_H + n_L a_L$, that $E(a^2) = n_H a_H^2 + n_L a_L^2$, that $a_H = ka_L$ and that $n_L = 1 - n_H \geq 0.5$. Substituting these values and rearranging the expression, equation (60) is rewritten as

$$0 \leq n_H k^2 (n_L - n_H) + n_L (1 + n_L) + k[(n_H k)^2 - n_L] \tag{61}$$

Condition (61) always holds for $n_H k \geq \sqrt{n_L}$. It also always holds if $n_L = n_H = 0.5$. In this case, condition (61) is equivalent to $0 \leq k^3 + 3 - 2k$, which is true for all $k \geq 1$. By continuity (61) also holds when n_L is close enough of 0.5. By contrast, if n_L is large (i.e., close to 1 so that n_H is close to 0), then condition (61) boils down to $0 \leq 2 - k$, which is violated whenever $k > 2$.

9.5 Proof of Proposition 2

Let $a_L = a$ and $a_H = ka$ with $k > 1$ and $a > 1$, one obtains the following inequalities

$$U_A^c \quad \geq \quad U_A^d \tag{62}$$

$$\Leftrightarrow \quad \frac{(sNE(a^2) + a_H)^2}{4sN(a_H^2 + E(a^2))} \quad \geq \quad \frac{sN(1 + n_H)}{4} \left[\frac{a_L Ea}{a_L + Ea} + \frac{1}{sN(1 + n_H)} \right]^2 \tag{63}$$

$$\Leftrightarrow \quad \frac{[a_H + sNE(a^2)]^2}{a_H^2 + E(a^2)} \quad \geq \quad \frac{1}{1 + n_H} \left[1 + \frac{a_L sN(1 + n_H)Ea}{a_L + Ea} \right]^2 \tag{64}$$

$$\Leftrightarrow \quad \frac{[k + asN(n_L + k^2 n_H)]^2}{n_L + k^2(1 + n_H)} \quad \geq \quad \frac{1}{1 + n_H} \left[1 + \frac{asN(n_L + kn_H)(1 + n_H)}{1 + n_L + kn_H} \right]^2 \tag{65}$$

$$\Leftrightarrow \quad \frac{\left[1 + sNak(\frac{n_L}{k^2} + n_H) \right]^2}{\frac{n_L}{k^2} + 1 + n_H} \quad \geq \quad \frac{1}{1 + n_H} \left[1 + sNak(\frac{n_L}{k} + n_H)\frac{1 + n_H}{1 + n_L + kn_H} \right]^2 \tag{66}$$

Dividing the last equation left and right by $\frac{n_L}{k^2} + 1 + n_H$ yields

$$\left[1 + sNak \left(\frac{n_L}{k^2} + n_H \right) \right]^2 \geq \left(1 + \frac{n_L}{(1 + n_H)k^2} \right) \left[1 + sNak(\frac{n_L}{k} + n_H)\frac{1 + n_H}{1 + n_L + kn_H} \right]^2 \tag{67}$$

which is equivalent to

$$\left[\frac{1 + sNa_H \left(n_H + \frac{n_L}{k^2} \right)}{1 + sNa_H(n_H + \frac{n_L}{k})\frac{1 + n_H}{1 + n_H k + n_L}} \right]^2 \geq 1 + \frac{n_L}{(1 + n_H)k^2}. \tag{68}$$

When looking at limit cases, one gets

$$\lim_{k \to +\infty} \frac{U_A^c}{U_A^d} = \frac{\lim\limits_{k \to +\infty} (kasNn_H)^2}{(asN(1+n_H))^2} = \left(\frac{n_H}{1+n_H}\right)^2 \lim_{k \to +\infty} k = +\infty \tag{69}$$

$$\lim_{k \to 1} \frac{U_A^c}{U_A^d} = 2(1+n_H)\left(\frac{1+sNa}{2+sNa(1+n_H)}\right)^2 > 1 \qquad \forall s \in [\frac{1}{N_H}, 1] \tag{70}$$

$$\lim_{n_H \to 0} \frac{U_A^c}{U_A^d} = \frac{4}{k^2+1}\left(\frac{k+sNa}{2+sNa}\right)^2 < 1 \qquad \forall k \geq \sqrt{3} \tag{71}$$

The ratio in equation (70) is strictly larger than 1 if and only if $(sNa)^2(1+n_H) > 2$. Since $a \geq 1$ and $s \in [\frac{1}{N_H}, 1]$ a sufficient condition for the ratio (70) to be larger than 1 is $1 + n_H \geq 2n_H^2$, which is always true for $n_h \in [0, 1]$. Similarly equation (71) is equivalent to $0 < \frac{k^2-3}{4}sNa + \frac{1}{sNa} - 2k + k^2 + 1$. Since $-2k + k^2 + 1 \geq 0 \ \forall k \geq 1$, a sufficient condition for the ratio (71) to be smaller than 1 is $k \geq \sqrt{3}$.

9.6 Proof of Proposition 3

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 production of the local public good in state L ($q_L = \tau y_L$) perfectly complements the production of the national public good ($Q = ty$). This implies for state H that the production of the national public good is insufficient compared to its production of the local public good: $q_H = \frac{ty}{y_L} y_H > Q = ty$.

The representative agent of state L chooses t so as to maximize the utility function defined in equation (7) where the private consumption is $x_L = (1 - t - \tau)y_L$. He solves his utility function under the constraint that $1 - t - \tau = 1 - \frac{a_L + Ea}{a_L} t \geq 0$:

$$\max_t U_L^c = tEa\big(1 + a_L(1-t) - tEa\big) \tag{72}$$

The utility function is strictly concave in t. The optimal solution for L is

$$t^{c*} = \frac{a_L + 1}{2\big(a_L + Ea\big)}. \tag{73}$$

Substituting this value in the constraint yields $1 - t^{c*} - \tau = \frac{a_L - 1}{2a_L} > 0$, which is true by assumption 2. Substituting t^{c*} in the different quantities, we are able to compute the utility levels reached by the representative agent of each state:

$$U_L^{c*} = \frac{(a_L + 1)^2}{4} \frac{Ea}{a_L + Ea} \tag{74}$$

$$U_H^{c*} = \left(1 + \frac{(k-1)(a_L - 1)}{a_L + 1}\right) U_L^{c*} \tag{75}$$

Since $k \geq 1$ and $a_L > 1$, it is easy to check that $U_H^{c*} \geq U_L^{c*}$ by comparing equations (74) and (75). The representative citizen of the rich region has a final net utility which is higher than the representative agent of the poor region. However inequalities decrease with the transition to democracy. First the autocrat receives the same utility than the representative citizen of state H, and next the inequalities between the representative citizen of state H and L decrease. That is

$$\frac{U_H^{c*}}{U_L^{c*}} = 1 + \frac{(k-1)(a_L - 1)}{a_L + 1} \leq \frac{U_H^c}{U_L^c} = k + \frac{1-s}{s(N_H - 1)} \frac{(sN_H a_H - 1)k + sN_L a_L}{2}. \tag{76}$$

Indeed, one gets that $1 + \frac{(k-1)(a_L - 1)}{a_L + 1} \leq k$ is equivalent to $a_L - 1 \leq a_L + 1$, so that equation (76) is always true for all $s \in [\frac{1}{N_H}, 1]$.

9.7 Decentralization of local taxes τ_H and τ_L

In the decentralization case t is uniform across states but the taxation and the decision about the local public good is decentralized at the state level so that $\tau_H \neq \tau_L$. When the power to choose t lies in L then $ty = \tau_L y_L$. In other words, the production of the local public good in state 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, state H implements $\tau_H = t\frac{y}{y_H} < \tau_L$. Since it is more productive than state L, state H chooses a lower local tax rate to match the available provision

of national public good so that $y_H = a_H\sqrt{ty}$. We deduce that

$$\frac{y_H}{y_L} = \frac{a_H}{a_L} = k. \tag{77}$$

Equation (77) is identical to equation (11), and it implies that $y_H = a_H tEa$, that $y_L = a_L tEa$, and

$Q = yt = (Ea)^2 t^2$. Substituting these values in the utility function defined in (7) where the private

consumption is $x_L = (1 - t - \tau_L)y_L$, one sees that the representative agent of state L chooses t so as

to maximize

$$\max_t U_L^d = tEa\left(1 + (1 - t)a_L + Eat\right) \tag{78}$$

It is easy to check that the utility function is strictly concave in t. The optimal solution for state L is

$$t^{d*} = \frac{a_L + 1}{2\big((1 + n_L)a_L + n_H a_H\big)} \tag{79}$$

Substituting this value in the constraint yields $1 - t^{d*} - \tau_L = \frac{a_L - 1}{2a_L} > 0$, which is true by Assumption

2. Substituting t^{d*} in the different quantities yields $y_H = a_H \frac{a_L + 1}{2}\frac{Ea}{Ea + a_L} = ka_L\frac{a_L + 1}{2}\frac{Ea}{Ea + a_L}$ and

$y_L = a_L\frac{a_L + 1}{2}\frac{Ea}{Ea + a_L}$, and $Q = q_H = q_L = \frac{(a_L + 1)^2}{4}\left(\frac{Ea}{Ea + a_L}\right)^2$. We deduce that

$$U_L^{d*} = \frac{(a_L + 1)^2}{4}\frac{Ea}{Ea + a_L} \tag{80}$$

and that

$$U_H^{d*} = \frac{(a_H + 1)(a_L + 1)}{4}\frac{Ea}{Ea + a_L}\left(2 - \frac{(a_L + 1)\frac{Ea}{Ea + a_L}}{(a_H + 1)\frac{Ea}{Ea + a_H}}\right) \tag{81}$$

Since $a_H = ka_L$, this is equivalent to

$$U_H^{d*} = \left(2\frac{ka_L + 1}{a_L + 1} - \frac{Ea + ka_L}{Ea + a_L}\right)U_L^{d*} \tag{82}$$

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Since $\frac{ka_L+1}{a_L+1} = 1 + \frac{(k-1)a_L}{a_L+1}$ we can rewrite this equation as

$$U_H^{d*} = \left(1 + \frac{(k-1)a_L}{a_L+1} + \frac{(ka_L+1)(Ea+a_L) - (Ea+ka_L)(a_L+1)}{(a_L+1)(Ea+a_L)}\right) U_L^{d*} \tag{83}$$

Simplifying this equation returns equation (23).

9.8   Proof of corollary 1

We need to show that $U_H^{d*} > U_H^{c*}$, which is equivalent to $\left(1 + \frac{a_L(k-1)}{a_L+1}\frac{2Ea+a_L-1}{Ea+a_L}\right)U_L^{d*} > \left(1 + \frac{(k-1)(a_L-1)}{a_L+1}\right)U_L^{c*}$.

Since $U_L^{c*} = U_L^{d*}$ this inequality is equivalent to $\frac{a_L(k-1)}{a_L+1}\frac{2Ea+a_L-1}{Ea+a_L} > \frac{(k-1)(a_L-1)}{a_L+1}$. Simplifying this in-

equality we obtain the condition $a_L(2Ea + a_L - 1) > (a_L - 1)(Ea + a_L)$, which is equivalent to

$a_L - 1 > 0$. This is always true by assumption 2.

9.9   Proof of equation (31)

Under decentralization, citizens of region L would rebel and demand democracy since $U_L^d < U_L^{d*}$. For

citizens in region H under decentralized autocracy, equation (54) is defined as

$$U_H^d = \frac{1}{2}\left[\frac{a_L Ea}{a_L + Ea} + \frac{1}{sN(1+n_H)}\right]\left[1 + \frac{(k-1)a_L Ea}{a_L + Ea} + \frac{1-s}{2s(N_H-1)}\left(\frac{a_L EasN(1+n_H)}{a_L + Ea} - 1\right)\right] \tag{84}$$

First of all, note that if the autocrat is greedy and chooses $s = 1$, then (84) is equivalent to

$$U_H^d = \frac{1}{2}\left[\frac{a_L Ea}{a_L + Ea} + \frac{1}{N(1+n_H)}\right]\left[1 + \frac{(k-1)a_L Ea}{a_L + Ea}\right] \tag{85}$$

Taking the limit when N is very large and denoting $a_L = a$ and $a_H = ka$, one obtains

$$\lim_{N \to +\infty} U_H^d = \frac{1}{2}\frac{a_L Ea}{a_L + Ea}\left[1 + \frac{(k-1)a_L Ea}{a_L + Ea}\right] \tag{86}$$

$$= \frac{1}{2}\frac{a(n_H k + n_L)}{(n_H k + n_L + 1)}\left[1 + (k-1)\frac{a(n_H k + n_L)}{(n_H k + n_L + 1)}\right] \tag{87}$$

The utility of a representative agent of region H under decentralized democracy is

$$U_H^{d*} = \frac{(1+ka)(a+1)(n_L+kn_H)}{4(1+n_L+kn_H)}\left[2 - \frac{(a+1)(n_L+k(1+n_H))}{(1+ka)(1+kn_H+n_L)}\right] \tag{88}$$

We deduce that $\lim_{N\to+\infty} U_H^d < U_H^{d*}$ is equivalent to

$$a + \frac{a^2(k-1)(n_Hk+n_L)}{(n_Hk+n_L+1)} < \frac{a+1}{2(n_Hk+n_L+1)}\left[(n_Hk+n_L)(2ak+1-a)+2+k(a-1)\right] \tag{89}$$

which is equivalent to

$$0 < a^2(n_Hk+n_L) + 2a(n_Hk+n_L)(k-1) + k(a^2-1) + 2 + n_Hk + n_L \tag{90}$$

The last inequality is always true as $a \geq 1$ and $k > 1$. Therefore $\lim_{N\to+\infty} U_H^d < \lim_{N\to+\infty} U_H^{d*}$ always holds. With a greedy autocrat under decentralization, citizens of H would be better off under democracy. If the autocrat does not share his bribes and choose to decentralized, they will join the rebellion from region L as $U_L^d < U_L^{d*}$. Therefore the autocrat is certain to be overthrown, with $\alpha_d = 0$.

There exists a situation in which the autocrat would share the bribes with citizens in H to avoid a coup. If he is threatened from within, he will be willing to set $s = \frac{1}{N_H}$. This implies that U_H^d in equation (84) becomes

$$U_H^d = \frac{1}{4}\left[\frac{a_L Ea}{a_L + Ea} + \frac{n_H}{1+n_H}\right]\left[1 + \frac{a_L Ea}{a_L + Ea}\left(2(k-1) + \frac{1+n_H}{n_H}\right)\right]$$

Denoting $a_L = a$ and $a_H = ka$, the utility of a representative agent of region H under decentralized autocracy can be rewritten as

$$U_H^d = \frac{1}{4}\left[\frac{a(n_Hk+n_L)}{n_Hk+n_L+1} + \frac{n_H}{1+n_H}\right]\left[1 + \frac{a(n_Hk+n_L)}{n_Hk+n_L+1}\left(2(k-1) + \frac{1+n_H}{n_H}\right)\right] \tag{91}$$

Let $a = 1$ and let $A = \dfrac{a(n_H k + n_L)}{n_H k + n_L + 1}$, then equation (91) is equivalent to

$$U_H^d = \frac{1}{4}\left[A + \frac{n_H}{1 + n_H}\right]\left[1 + A\left(2(k-1) + \frac{1 + n_H}{n_H}\right)\right] \tag{92}$$

Similarly, equation (88) is equivalent to $U_H^{d*} = \dfrac{2(1+k)A}{4}\left[2 - 2\frac{1}{1+k}\left(1 + \frac{k-1}{1+kn_H+n_L}\right)\right]$, which yields

$$U_H^{d*} = A\left[k - \frac{k-1}{1 + kn_H + n_L}\right] \tag{93}$$

Let $n_H = 1 - n_L = n$ so that $A = \dfrac{n(k-1)+1}{n(k-1)+2}$ and $U_H^{d*} > U_H^d$ is equivalent to

$$A\left[k - \frac{k-1}{2 + (k-1)n}\right] > \frac{1}{4}\left[A + \frac{n}{1+n}\right]\left[1 + A\left(2(k-1) + \frac{1+n}{n}\right)\right] \tag{94}$$

Rearranging the terms of this inequality, one gets

$$\frac{2k}{n(2 + n(k-1))} + \frac{2(k-1)(k-3)}{2 + n(k-1)} > \frac{1}{A} + A\frac{1 - n^2}{n^2} \tag{95}$$

When $a = 1$, one obtains that $U_H^{d*} > U_H^d$ if and only if $H(x) > 0$, with $x = k - 1$ and

$$H(x) = \frac{2x(x-2)}{2 + xn} + \frac{2(x+1)}{n(2 + xn)} - \frac{2 + xn}{1 + xn} - \frac{1 - n^2}{n^2}\frac{1 + xn}{2 + xn}. \tag{96}$$

Under assumption 3, $x = k - 1 \geq \frac{n+2}{n}$. It is easy to check that $H'(x) > 0 \ \forall x \geq \frac{n+2}{n}$ and that $H\left(\frac{n+2}{n}\right) > 0$. Therefore under assumption 3, one obtains that $H(x) \geq H\left(\frac{n+2}{n}\right) > 0$.

9.10 Proof of Assumption 3

We aim to find sufficient condition so that $U_H^{c*} < U_H^c$, whereby

$$U_H^{c*} = \left(1 + \frac{(k-1)(a_L - 1)}{a_L + 1}\right)\frac{(a_L + 1)^2}{4}\frac{Ea}{a_L + Ea} \tag{97}$$

$$U_H^c = \left(k + \frac{1-s}{s(N_H - 1)} \frac{(sN_H a_H - 1)k + sN_L a_L}{2}\right) \frac{a_H + sNE(a^2)}{2sN(a_H^2 + E(a^2))} a_L \tag{98}$$

We have that U_H^c is decreasing in $s \in [\frac{1}{N_H}, 1]$. We deduce that if $U_H^{c*} < U_H^c$ for $s = 1$, then it is true

for all $s \in [\frac{1}{N_H}, 1]$. Remember that we assume here that $a_L = a \equiv 1$ and $a_H = ka \equiv k$ and $N \to +\infty$.

We deduce that $U_H^{c*} < U_{H[s=1]}^c$ is equivalent to

$$\frac{n_H k + n_L}{1 + n_H k + n_L} < \frac{n_H k^2 + n_L}{(1 + n_H)k^2 + n_L} \frac{k}{2} \tag{99}$$

It is easy to check that $\frac{n_H k + n_L}{1 + n_H k + n_L}$ is increasing in k, while $\frac{n_H k^2 + n_L}{(1+n_H)k^2 + n_L}$ is decreasing in k. A sufficient

condition for $U_H^{c*} < U_H^c \ \forall s \in [\frac{1}{N_H}, 1]$ is therefore that

$$2\frac{n_H + 1}{n_H} \leq k \tag{100}$$

9.11 Proof of Proposition 4

The autocrat chooses decentralization when $V_A^d + K - V_A^c > 0$. Using equations (29) in (33) and

adding K, the dictator chooses decentralization if and only if

$$\alpha_c\left(U_A^c - U_H^{c*} + K\right) < (k-1)\frac{Ea}{1 + Ea}U_H^{c*} + K \tag{101}$$

$$\Leftrightarrow \quad \alpha_c\left(U_A^c - U_H^{c*} + K\right) < (k-1)\left[\frac{n_H k + n_L}{1 + n_H k + n_L}\right]^2 + K \tag{102}$$

When $s > \frac{1}{N_H}$ the autocrat extracts a larger share than what he redistributes to citizens in H,

we deduce from equation (39) that $\lim_{N \to +\infty} U_A^c = +\infty$. Hence, equation (101) does not hold and the

autocrat always chooses to maintain a centralized autocratic system.

When $s = \frac{1}{N_H}$, the autocrat shares the bribe equally between himself and other citizens in H. We

deduce from equation (39) that, when $N \rightarrow +\infty$, equation (101) can be written as

$$\alpha_c \left(\frac{1}{4n_H} \frac{\left[n_H E(a^2) + k\right]^2}{k^2 + E(a^2)} - \frac{n_H k + n_L}{1 + n_H k + n_L} \right) < (k-1) \left[\frac{n_H k + n_L}{1 + n_H k + n_L} \right]^2 + (1 - \alpha_c)K$$

$$\Leftrightarrow \quad \alpha_c \left(\frac{1}{4n_H} \frac{\left[n_H E(a^2) + k\right]^2}{k^2 + E(a^2)} - \frac{Ea}{1 + Ea} \right) < (k-1) \left[\frac{Ea}{1 + Ea} \right]^2 + (1 - \alpha_c)K$$

When $s = \frac{1}{N_H}$, there are many values of the parameters so that this inequality holds. For instance, it holds when the penalty for a violent transition K is large enough. Decentralization and a peaceful transition to democracy is more likely when K is large. Even if K is small, there are many values of the parameters so that the inequality holds. For instance one can check that if $n_H = 0.25$ (that is, $n_L = 0.75$) and $k = 4$ then the inequality holds even if $K = 0$. In this case, one sees that $Ea = \frac{k+3}{4} = \frac{7}{4}$ and $Ea^2 = \frac{k^2+3}{4} = \frac{19}{4}$. We deduce that the RHS of the inequality is $3 \left(\frac{7}{11} \right)^2 \simeq 1.214$, while the LHS is $\alpha_c \left(\frac{\left(\frac{19}{16} + 4 \right)^2}{16 + \frac{19}{4}} - \frac{7}{11} \right) = \alpha_c \left(\frac{83}{64} - \frac{7}{11} \right) \simeq 0.66\alpha_c < 1$.

10 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,

$$u(q_r, Q, x_r) = q_r^{0.5\alpha} Q^{0.5\alpha} x_r^{1-\alpha} \tag{103}$$

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

$$y_r = a_r \left(\min\{q_s, Q\}\right)^{0.5} \tag{104}$$

It implies that the results of Section 4 and Proposition 1 still hold,

$$\frac{y_H^c}{y_L^c} = \left(\frac{a_H}{a_l}\right)^2 > \frac{y_H^d}{y_L^d} = \frac{a_H}{a_l} \tag{105}$$

10.1 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 state H. He chooses t so as to maximize the utility function defined in (103) 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,

$$\max_t U_H = \frac{E(a^2)^{1+\alpha}}{a_H^{2\alpha}} t^{1+\alpha} \left(1 - \Psi t\right)^{1-\alpha} \tag{106}$$

The optimal solution is found at

$$t^c = \frac{1 + \alpha}{2\Psi} \tag{107}$$

It is a (local) maximum, as the second derivative is such that $\frac{d^2 U_H}{dt^2} < 0$ for $t = t^c$. Substituting the value of equation (107) 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. For agent in region H we have $q_H = Q$ so that

$$U_H^c = Q^\alpha[(1 - t^c - \tau)y_H]^{1-\alpha} \tag{108}$$

$$U_H^c = \frac{(1 - \alpha)^{1-\alpha}}{a_H^{2\alpha}} \left[\frac{(1 + \alpha)E(a^2)}{2\Psi}\right]^{1+\alpha} \tag{109}$$

For the representative agent of region L we have

$$U_L^c = q_L^{0.5\alpha} \, Q^{0.5\alpha}[(1 - t^c - \tau)y_L]^{1-\alpha} \tag{110}$$

$$= \frac{(1 - \alpha)^{1-\alpha}}{a_H^{2\alpha}} \left[\frac{(1 + \alpha)E(a^2)}{2\Psi}\right]^{1+\alpha} \left(\frac{a_L}{a_H}\right)^{2-\alpha} \tag{111}$$

$$= U_H^c \left(\frac{a_L}{a_H}\right)^{2-\alpha} \tag{112}$$

10.2   Decentralization in autocracy

In the decentralization case, t is uniform across states but the taxation and the decision about the local public good is decentralized at the state 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 state H. He chooses t so as to maximize the utility function defined in equation (103), where the private consumption is $x_H = (1 - t - \tau_H)y_H = (1 - t\psi_H)y_H$. He solves the following maximization:

$$\max_t U_H = (Ea)^{2\alpha}(a_H Ea)^{1-\alpha} \, t^{1+\alpha} \, (1 - \psi_H t)^{1-\alpha}. \tag{113}$$

The optimal solution for state H is thus

$$t^d = \frac{1+\alpha}{2\psi_H} \tag{114}$$

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. However 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 $\psi_L \equiv \frac{a_L + Ea}{a_L}$. 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

$$\frac{a_H}{a_L} < \frac{3n_H + \alpha(2 - n_H)}{n_H(1 - \alpha)} \tag{115}$$

It is easy to see that the RHS of inequality (115) is larger than 3 for all $\alpha \in [0, 1)$. We deduce that whenever $a_H < 3a_L$, the inequality (115) always holds strictly for all $n_H \in [0, 1]$. Similarly, when α converges to 1, the RHS becomes infinite and (115) always holds strictly. By continuity it holds for value of α close enough from 1. It implies that the set, so that the interior solution described above is the equilibrium, is not empty.

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

$$U_H^d = \left(\frac{(1+\alpha)Ea}{a_H + Ea} \right)^{1+\alpha} \left(\frac{a_H}{2} \right)^2 (1-\alpha)^{1-\alpha} \tag{116}$$

$$U_L^d = \left(\frac{(1+\alpha)Ea}{a_H + Ea} \right)^{1+\alpha} \left(\frac{a_H}{2} \right)^2 (1-\alpha)^{1-\alpha} \left(\frac{a_L}{a_H} \right)^{1-\alpha} \left(\frac{2}{1-\alpha} - \frac{\psi_L}{\psi_H} \right)^{1-\alpha} \tag{117}$$

$$= U_H^d \left(\frac{a_L}{a_H} \right)^{1-\alpha} \left(\frac{2}{1-\alpha} - \frac{\psi_L}{\psi_H} \right)^{1-\alpha} \tag{118}$$

The last term is strictly positive if condition (115) holds.

10.3 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.

10.3.1 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 state chooses both local and national taxes, or when decentralization holds and the rich state chooses national taxes. We deduce that $y_L = a_L t Ea$ and $y_H = a_H t Ea$ 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 state L chooses t so as to maximize the utility function defined in (103) where the private consumption is $x_L = (1 - t - \tau)y_L = (1 - t\psi_L)y_L$. He solves the

following equation

$$\max_{t} U_L = (Ea)^{1+\alpha}(a_L)^{1-\alpha} \, t^{1+\alpha} \, (1 - t\psi_L)^{1-\alpha}. \tag{119}$$

The optimal solution for L is then

$$t_L^c = \frac{1+\alpha}{2\psi_L} \tag{120}$$

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 state:

$$U_L^{c*} = \left(\frac{(1+\alpha)Ea}{a_L + Ea} \right)^{1+\alpha} \left(\frac{a_L}{2} \right)^2 (1-\alpha)^{1-\alpha} \tag{121}$$

$$U_H^{c*} = \left(\frac{(1+\alpha)Ea}{a_L + Ea} \right)^{1+\alpha} \left(\frac{a_L}{2} \right)^2 (1-\alpha)^{1-\alpha} \left(\frac{a_H}{a_L} \right)^{1-\alpha} \tag{122}$$

When computing the ratio, one gets

$$\frac{U_H^{c*}}{U_L^{c*}} = \left(\frac{a_H}{a_L} \right)^{1-\alpha} > 1 \tag{123}$$

since $a_H > a_L$. Comparing equations (112) and (123) 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

$$\frac{U_H^{c*}}{U_L^{c*}} = \left(\frac{a_H}{a_L} \right)^{1-\alpha} < \frac{U_H^c}{U_L^c} = \left(\frac{a_H}{a_L} \right)^{2-\alpha} \tag{124}$$

10.3.2 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 state 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, state H implements $\tau_H = t\frac{y}{y_H} < \tau_L$. Since it is more productive than state L, state 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 $y_H = a_H tEa$, $y_L = a_L Eat$, $Q = yt = (Ea)^2 t^2$. 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 state L hence chooses t so as to maximize

$$\max_t U_L = (Ea)^{1+\alpha}(a_L)^{1-\alpha} t^{1+\alpha}(1 - t\psi_L)^{1-\alpha} \tag{125}$$

The optimal solution is given by

$$t_L^d = \frac{1+\alpha}{2\psi_L} \tag{126}$$

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

$$U_L^{d*} = \left(\frac{(1+\alpha)Ea}{a_L + Ea}\right)^{1+\alpha} \left(\frac{a_L}{2}\right)^2 (1-\alpha)^{1-\alpha} \tag{127}$$

$$U_H^{d*} = \left(\frac{Ea}{a_L + Ea}\right)^{1+\alpha} \left(\frac{(1+\alpha)a_L}{2}\right)^2 \left(\frac{2}{1+\alpha} - \frac{\psi_H}{\psi_L}\right)^{1-\alpha} \left(\frac{a_H}{a_L}\right)^{1-\alpha} \tag{128}$$

$$= U_L^{d*} \left(\frac{2}{1+\alpha} - \frac{\psi_H}{\psi_L}\right)^{1-\alpha} \left(\frac{1+\alpha}{1-\alpha}\right)^{1-\alpha} \left(\frac{a_H}{a_L}\right)^{1-\alpha} \tag{129}$$

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

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Proposition 5. *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(121) and (127), it is straightforward to see that $U_L^{c*} = U_L^{d*}$. Now comparing equation (122) with (128) one can check 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 $\frac{1-\alpha}{1+\alpha} > \frac{\psi_H}{\psi_L}$. The last part is always true since $\psi_H < \psi_L$.

11   Empirical Analysis

11.1   Data sources

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).

- **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 captures the level of societal domestic instability, we hence rename it *Domestic Instability* for visibility sake. The variable *totciv* in the dataset captures the level of societal (civil and ethnic) instability in neighboring countries, we hence rename it *Foreign Instability* for visibility sake. 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.

- **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.

11.2 Standardization through z-scores

We run the set of regression following equation (5), using standardized units for each the three measures of political environment (*Polity, Domestic Instability, Foreign Instability*). That is, we use z-scores, which compare the observed value of the variable to its mean and standard deviation across all periods, for a given country. 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. As before, we aim to proxy for a rather robust instability or democratic pressure, the key dependent variables therefore represent the average z-scores of each political index between the current period t and the past period $t - 1$, that is, $E_1(Z.x)_{i,t} = \big(Z.x_{i,t} + Z.x_{i,t-1}\big)/2$. Results are similar to those obtained in Table 2, as can be seen in Table 3, and coefficients are actually more significant.

Table 3: Correlation between fiscal autonomy and political instability (Z=scores)

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency			Tax decentralization		
$E_1(Z.Polity)$	0.433***	0.461**	0.536***	0.0278***	0.0265***	0.0236***
	(0.155)	(0.191)	(0.203)	(0.00681)	(0.00768)	(0.00811)
$E_1(Z.Domestic)$		-0.624***	-0.581***		0.0244***	0.0262***
		(0.173)	(0.182)		(0.00633)	(0.00662)
$E_1(Z.Foreign)$			-0.952**			0.0183*
			(0.424)			(0.00966)
Constant	-7.827***	-8.819**	-10.70**	-0.292***	-0.333**	-0.295*
	(2.099)	(3.485)	(4.122)	(0.0856)	(0.142)	(0.160)
Observations	270	173	155	351	218	201
R-squared	0.885	0.922	0.926	0.806	0.723	0.661

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Regressions run with country and year fixed effects, controlling for 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.

11.3 Including additional lags to account for past instability

Our main regressions of interest account for the average political environment observed during the current and past year (t and t-1). One may wonder how the results change when including older instability events, i.e., when adding values up to two and three years ago into the average (t-2 and t-3).

Tables 4 and 5 aim at capturing the effect of a more sustainable political instability on fiscal decentralization. Defining $E_j(x)_{i,t} \equiv \frac{1}{j} \sum_{k=0}^{j} x_{i,t-j}$, the two tables display the set of regression below for each $Y = \{Transfer\ dependency,\ Tax\ decentralization\}$, and each $j = \{2, 3\}$:

$$Y_{i,t} = \beta_0 + \beta_1 E_j(Polity)_{i,t} + \beta_2 E_j(Domestic)_{i,t} + \beta_3 E_j(Foreign)_{i,t} + \alpha_i + \mu_t + u_{i,t}^Y \quad (130)$$

Similarly, Tables 6 and 7 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 $j = \{2,3\}$:

$$Y_{i,t} = \beta_0 + \beta_1 E_j(Polity)_{i,t} + \beta_2 E_j(Z.Domestic)_{i,t} + \beta_3 E_j(Z.Foreign)_{i,t} + \alpha_i + \mu_t + u_{i,t}^Y \ (131)$$

Tables 4 to 7 show that, overall, results from Table 2 still hold when including up to three past years in the main averages.[29] 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 4: Correlation between transfer dependency and political pressure (including t-2 and t-3 levels)

	(1)	(2)	(3)	(4)	(5)	(6)
			Transfer dependency			
$E_2(Polity)$	0.230***	0.156***	0.160***			
	(0.0537)	(0.0542)	(0.0541)			
$E_2(Domestic)$		-0.581***	-0.616***			
		(0.131)	(0.133)			
$E_2(Foreign)$			-0.123			
			(0.0831)			
$E_3(Polity)$				0.262***	0.177***	0.179***
				(0.0546)	(0.0566)	(0.0565)
$E_3(Domestic)$					-0.588***	-0.640***
					(0.142)	(0.146)
$E_3(Foreign)$						-0.139
						(0.100)
Constant	-9.588***	-7.696***	-7.590***	-9.914***	-7.778***	-7.760***
	(2.467)	(2.407)	(2.401)	(2.448)	(2.418)	(2.413)
Observations	273	273	273	273	273	273
R-squared	0.888	0.897	0.898	0.890	0.898	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 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*.

[29]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 5: Correlation between tax autonomy and political pressure (including t-2 and t-3 levels)

	(1)	(2)	(3)	(4)	(5)	(6)
			Tax decentralization			
$E_2(Polity)$	0.00295	0.00448**	0.00392*			
	(0.00204)	(0.00209)	(0.00210)			
$E_2(Domestic)$		0.0164***	0.0154***			
		(0.00573)	(0.00573)			
$E_2(Foreign)$			0.00615**			
			(0.00312)			
$E_3(Polity)$				0.00172	0.00290	0.00201
				(0.00207)	(0.00216)	(0.00218)
$E_3(Domestic)$					0.0117*	0.00999
					(0.00623)	(0.00624)
$E_3(Foreign)$						0.00743**
						(0.00344)
Constant	-0.107	-0.136*	-0.162**	-0.100	-0.123	-0.153*
	(0.0800)	(0.0797)	(0.0804)	(0.0812)	(0.0817)	(0.0824)
Observations	356	356	356	353	353	353
R-squared	0.826	0.831	0.833	0.825	0.827	0.830

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

Table 6: 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 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 7: Correlation between tax autonomy and political pressure (past Z-scores)

	(1)	(2)	(3)	(4)	(5)	(6)
			Tax decentralization			
$E_2(Z.Polity)$	0.0235***	0.0200**	0.0175**			
	(0.00722)	(0.00834)	(0.00884)			
$E_2(Z.Domestic)$		0.0255***	0.0279***			
		(0.00734)	(0.00773)			
$E_2(Z.Foreign)$			0.0189*			
			(0.0112)			
$E_3(Z.Polity)$				0.0172**	0.0115	0.00976
				(0.00759)	(0.00903)	(0.00960)
$E_3(Z.Domestic)$					0.0231***	0.0258***
					(0.00847)	(0.00899)
$E_3(Z.Foreign)$						0.0170
						(0.0126)
Constant	-0.300***	-0.317**	-0.282*	-0.298***	-0.292*	-0.270
	(0.0876)	(0.148)	(0.168)	(0.0894)	(0.153)	(0.173)
Observations	348	215	198	345	212	195
R-squared	0.802	0.713	0.647	0.798	0.703	0.634

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Regressions run with country and year fixed effects, controlling for 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.

11.4 Assuming lags between fiscal decision and implementation: removing current levels

Let's now test our results if we remove the current levels of democracy and instabilities from the equation and only focus on past instabilities. Results using the average values of last and second to last year are displayed in this section. For each $Y = \{Transfer\ dependency,\ Tax\ decentralization\}$, Table 8 displays the set of regression similar to equation (130), 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 9 focuses on z-scores and looks at regressions similar to equation (131), 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 levels and z-scores tables. Coefficients for domestic instabilities lose part of their significance for the tax decentralization ratio, but remain positive and significant at the 90 and 95 percent respectively, depending on whether one uses levels or

z-scores. Interestingly, we find again some evidence that transfer dependency may decrease with past foreign instability (coefficient significant at 95 percent, see Table 9). The tax revenue decentralization also seem positively affected by past foreign instability, although the coefficient is significant at the 90 percent confidence interval only (Table 8).

Results are similar if we use the third lag average, defined by $E_{03}(x)_{i,t} \equiv \frac{1}{j} \sum_{k=1}^{j} x_{i,t-3}$, which includes values from last year, two years ago and three years ago. Tables are not displayed for visibility sake, but available on demand.

Table 8: Correlation between fiscal autonomy and past political instability, without current values

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency			Tax decentralization		
$E_{02}(Polity)$	0.201***	0.150***	0.150***	0.00181	0.00269	0.00227
	(0.0488)	(0.0489)	(0.0490)	(0.00190)	(0.00195)	(0.00195)
$E_{02}(Domestic)$		-0.482***	-0.488***		0.0103*	0.00973*
		(0.119)	(0.122)		(0.00546)	(0.00545)
$E_{02}(Foreign)$			-0.0167			0.00540*
			(0.0785)			(0.00285)
Constant	-9.222***	-7.668***	-7.632***	-0.0989	-0.118	-0.143*
	(2.475)	(2.424)	(2.435)	(0.0798)	(0.0800)	(0.0808)
Observations	274	274	274	357	357	357
R-squared	0.886	0.894	0.894	0.826	0.828	0.830

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

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

	(1)	(2)	(3)	(4)	(5)	(6)
	Transfer dependency			Tax decentralization		
$E_{02}(Z.Polity)$	0.481***	0.530***	0.568***	0.0145**	0.00618	0.00490
	(0.142)	(0.172)	(0.180)	(0.00665)	(0.00774)	(0.00825)
$E_{02}(Z.Domestic)$		-0.604***	-0.626***		0.0170**	0.0185**
		(0.171)	(0.179)		(0.00697)	(0.00735)
$E_{02}(Z.Foreign)$			-1.204**			0.0117
			(0.523)			(0.0101)
Constant	-8.002***	-9.066***	-11.74***	-0.286***	-0.273*	-0.265
	(2.097)	(3.458)	(4.152)	(0.0882)	(0.152)	(0.171)
Observations	271	173	155	349	215	198
R-squared	0.885	0.923	0.927	0.799	0.700	0.627

Note: t statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.Regressions run with country and year fixed effects, controlling for 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.