Ethnic divisions and the effect of appropriative competition intensity on economic performance*

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Abstract

This paper features a growth model with an appropriative contest and a common-pool investment game between politically organised rival ethnic factions. I determine how the long-run equilibrium coalition shapes incentives to invest, show the existence of a unique steady state, and investigate how the ease to capture rents affects economic performance. The use of numerical simulations concerning a global sample of countries demonstrates that contest intensity can sometimes be beneficial, despite wasteful grabbing behaviours, due to a mechanism related to the concentration of power. When rents become easier to capture, dominant groups have an incentive to expand their influence further. This adjustment can be beneficial as these groups contribute most to capital accumulation.

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1 Introduction

The presence of easily appropriable point-source natural resources like diamonds and oil are often deemed to be the cause of adverse political and economic consequences (Tsui, 2011). This issue is particularly relevant in natural resource-rich countries in the developing world, which possess more than half of the world's proven oil reserves. Leaders in these countries have been able to hold on to power for extended stretches of time by using a combination of redistribution and repression (Ross, 2001, 2008; Anyanwu and Erhijakpor, 2013; Boucekkine et al., 2014; Matsen et al., 2016). Yet, an ongoing debate in the economic resource curse literature concerns the consequences of rent capture due to oil endowments or other types of institutional characteristics, for income in the long run. Some recent contributions, such as that of Brunnschweiler and Bulte (2008), Alexeev and Conrad (2009) and Smith (2015), find a positive linkage between natural resources and development, thus discrediting the seminal finding of Sachs and Warner (1995).[1] Besides, the debate on the economic consequences of institutions encompasses arguments on both sides with some authors arguing that this effect become weak once the specific conditions of countries are controlled for (Rodrik et al., 2004; Acemoglu et al., 2008, 2009).

In this paper, I corroborate these recent findings by developing a theoretical mechanism of the potentially favourable effect of a greater ability to capture rents on investment and capital accumulation. An interpretation of this rent-seeking ability is the consequence of oil or other natural resources, or a weaker institutional environment characterised by an inefficient judiciary system incapable of stopping embezzlement by the political actors. I construct a discrete-time growth model with successive generations of agents representing competing political or ethnic factions. These clans enjoy current consumption and transfers to the next generation of their kinship, and they allocate their time between productive or appropriative activities. In this model, the exerted political efforts determine the proportion of de facto power of each clan, which subsequently sets the fraction of a common output available for their respective consumption. I use the concept of influence, or de facto power, to control resources for patronage and clientelism. De facto power, in opposition to de jure power, is what happens in practice or actuality, but is not officially established.[2]

[1] These papers use log GDP per capita instead of growth as dependent variable and treat the endogeneity caused by the correlation between oil wealth and initial income. Alexeev and Conrad (2009) question the negative association between oil and institutions as well.

[2] An extensive literature discusses the causes and consequences of these social phenomena. For instance, Bates (1983, 1988) and Bardhan (1999) describe the redistributive mechanisms like the marketing boards and the allocation of desirable government and state-owned enterprise jobs. The coup threat is a reason why politicians rely on patronage by providing a cut of the rents to opposing factions so that the attempt probability diminishes (Collier, 2010b; Francois et al., 2015). Besley and Persson (2010) model patronage explicitly and redistribution happens through taxation and spending on a group specific public good. Posner (2005) argues that diversity leads to clientelism and favouritism and that it is natural to measure the distribution of influence around the ethnic aspect. In Padro i Miquel (2007) the ruler taxes both sides and then returns patronage to the supporters. A similar mechanism is present in Acemoglu et al. (2004) where the ruler avoids challenges thanks to a threat of punishment and reward. La Porta et al. (1999) mention that costly rent-seeking and conflict harms the

First, I characterise the equilibrium of this model and demonstrate its uniqueness, and then, I show that the steady state of the model exists and is unique. Next, I study the effect of appropriative competition intensity on long-run income in this context where, apart from the obvious damaging effects due to conflicts and rent-seeking, I reveal a novel mechanism operating through the configuration of de facto power and the ensuing investment share in GDP. When de facto power is concentrated in the hands of a few dominant groups, their political efforts and power shares are boosted by a greater ease to divert resources, compared to smaller groups. There are negative externalities in this strategic common-pool framework where the consumption of one clan reduces availability for the others. Because the groups contributing to investment are the most influential, an increase in appropriative competition intensity could reduce these negative externalities by further expanding their influence, which in turn may spur investment in some cases.

To assess the importance of this mechanism, I calibrate the steady state for a global sample of 93 ethnically-divided countries using data on real GDP per capita and investment from the Penn World Tables version 9.0 (Feenstra et al., 2015), and politically relevant ethnic groups from the Ethnic Power Relations (EPR) database (Vogt et al., 2015). Using the calibrated parameters, I show numerically that, depending on the value of the capital share parameter, the positive impulse due to power concentration can conceivably dominate the slowdown caused by rent-seeking. This result is important considering the Lipset modernisation hypothesis, which affirms that societies that become richer tend to democratise. Compared with a power-sharing setting, a less democratic and more centralised regime could more easily coerce society into productive investments at the expense of short-sighted consumption. With long-term prospects, this ultimately might lead to a democratic transition beneficial to all strands of the population (Rao, 1984; Besley and Kudamatsu, 2007; Amegashie, 2008).

This paper relates to the literature on the economic consequences of corruption and rent-seeking.[3] Some of these contributions explicitly address resource windfalls (Collier, 2010a; Caselli and Tesei, 2016; Robinson et al., 2006; Anyanwu and Erhijakpor, 2013; Matsen et al., 2016; Caselli and Tesei, 2016). Such models study the negative repercussions in situations where adversaries compete for a prize or a common asset by engaging in unproductive appropriative behaviours. The contest success function is a modelling tool frequently used where the effort of a side increases its probability to win the prize. Here, I take the stance to investigate a conflict between politically organised ethnic groups.[4] Because of that,

provision of public goods when dominant clans use their supremacy to appropriate economic benefits.

[3]See, for instance, Becker (1983), Hirshleifer (1991), Skaperdas (1992), Lane and Tornell (1996), Benhabib and Rustichini (1996), de la Croix and Dottori (2008), Tangeras and Lagerlof (2009), de la Croix and Delavallade (2011) and Iqbal and Daly (2014).

[4]A priori, the factions competing for resources could be any type of social or political entity. Nevertheless, the reasons for focusing on ethnicities come from the theory of ethnic conflicts developed following the seminal contribution of Horowitz (1985), which exposes the primordialist and instrumentalist motives. In the primodialist view, the success of the group has value per se due to ancestral bonds, whereas the instrumentalist view relates to the benefits that the ethnicity generates. Bates (1983, 1988) underlines the importance of the geographical location of public goods and the cost-effectiveness due

a special feature of the model of this paper is to allow for more than two groups in the contest. Another particularity is the proportional distribution of the rents. This essential assumption stems from the logic of coalition formation in weak states and the concept of neopatrimonialism.[5] Furthermore, the EPR data used here reflect the politically salient ethnic divisions, an element well in line with the logic of the model.

The literature on ethnic diversity and conflict incidence underpins the modelling choices of this paper (Fearon and Laitin, 2003; Collier and Hoeffler, 2004; Cederman et al., 2009). In particular, some recent studies have demonstrated that natural resources cause conflicts at the local level (Caselli et al., 2015; Morelli and Rohner, 2015; Berman et al., 2017). I interpret increases in political efforts in the model by these violent actions aiming at capturing resources. For instance, armed groups could use violence to control zones crossed by major pipelines to secure the revenues accruing from them. Alternatively, in a weak institutional context, these political efforts could symbolise political activism to gain important positions in the public sphere or attempts to control the judiciary system with bribes and threats.

This paper is related to the institutional approach to economic development which is concerned with the fundamental causes of growth.[6] Many authors note that insecure property rights reduce prosperity through a negative effect on private investment (Rao, 1984; Acemoglu and Robinson, 2010; Besley and Ghatak, 2010). By examining the evolution of de facto power and investment, it also relates to the topic of the economic implications of political transitions (Tavares and Wacziarg, 2001).

2 The Model

Time is discrete and infinite, indexed by t $(t \geqslant 0)$. I consider a successive generations framework where society is divided into N clans, the set of which is denoted $\mathcal{N}$. Each clan $i \in \mathcal{N}$ has a constant demographic share n^i and a share of de facto power P_t^i at time t. These relative shares sum to one, i.e., $\sum_{i \in \mathcal{N}} n^i = 1$ and $\sum_{i \in \mathcal{N}} P_t^i = 1$ at all times. The stock of capital at time t is denoted K_t, an input of the production process of the economy, represented by a standard Cobb-Douglas function with capital

to the shared language in fuelling ethnic oppositions, while Fearon (1999) and Caselli and Coleman (2013) refer to the exclusivist nature of ethnic categories as a notable factor. Esteban and Ray (2008b,a) and Francois et al. (2015) describe the possibility that within-group inequalities result in the salience of ethnicities, which consist of rich and poor individuals who can contribute funds and labour to the technology of conflict.

[5]Neopatrimonialism, also called clientelism or patronage, is a system of social hierarchy where patrons use state resources to secure the loyalty of their clients in the population. An office of power is used for personal gains, as opposed to a strict division of the private and public spheres (Clapham, 1985). To sustain political coalitions in weak states, the ruler offers a cut of the rents to rival factions to deter coup plots and insurgencies with the aim to secure his dominant position. See Francois et al. (2014) and Francois et al. (2015) for the most recent discussion of this theory.

[6]North (1990); Acemoglu and Robinson (2005, 2012); North et al. (2009); Besley and Persson (2010); Baland et al. (2010); Collier (2010b)

and labour

$$Y_t = AK_t^{\alpha}L_t^{1-\alpha} \tag{1}$$

where A is the total factor productivity coefficient and the parameter $\alpha, 0 < \alpha < 1$ is capital elasticity, as usual. K_t denotes the capital stock at time t and L_t denotes labour input at time t. The preferences of the groups are represented by the utility function

$$U_t^i(\mathbb{C}_t, \mathbb{E}_t) = \log(C_t^i) + \beta \log(P_{t+1}^i Y_{t+1}) \tag{2}$$

where the parameter β, $\beta > 0$, is the discount factor and $P_{t+1}^i Y_{t+1}$ is the output slice transmitted to group i at $t+1$.[7] $\mathbb{C}_t$ is the $N \times 1$ vector of consumption strategies with typical element C_t^i, the consumption of group i. $\mathbb{E}_t$ is the $N \times 1$ vector of political effort strategies, with typical element E_t^i, the political effort of group i. I define this variable as the proportion of members of group i active in the political competition expressed as a fraction of total population.

The assumptions underlying the particular form of this utility function are in the spirit of the overlapping generations literature (Diamond, 1965; de la Croix and Michel, 2002). It is interesting to proceed this way because so far, few papers have considered overlapping generations and insecure property rights and have adopted a different approach.[8] Traditionally, in overlapping generations models, the consumption when old enters in the utility function. However, this possibility must be rejected here because the absence of property rights implies an impossibility to save privately. The second term of the utility function represents transfer or 'joy of giving' motives. The agents of the model care about the disposable income of the subsequent generation of their kinship, equal to the product of the own influence share and future production.

Another advantage of this method is to allow the derivation of closed-form solutions to games with dynamic aspects and many players, unlike other possibilities that are often limited to two-player settings because of technical difficulties. This feature is valuable to represent appropriately ethnic politics in this sample characterised by an abundance of divisions. Interestingly, an alternative modelling strategy with infinitely-lived representative agents would give the same results.[9] To study comparative

[7] I do not assume that β is less than one because it is the coefficient of the output slice used also for investment, beyond future consumption.

[8] Lagerlof (2014) has a distributive conflict over land among different political entities of a region. The article by de la Croix and Dottori (2008) features a Nash bargaining over the crop and is the first to implement strategic fertility decisions. Artige (2004) determines the optimal extraction by an infinitely lived dictator facing overlapping generations of agents subject to a non-insurgency constraint. Bellettini and Berti Ceroni (2000) study transaction costs and Weikard (1997) examines an intergenerational distributive conflict. Finally, Dincer and Ellis (2005) consider predation activities.

[9] The only change would be the interpretation of the utility function. It would entail infinitely-lived ethnic groups with

statics at the steady state, the infinite horizon of this setup is necessary because the power dynamics leads to it only asymptotically. I adopt this framework because limiting the number of periods would create a dependency on initial conditions. Here, the economy eventually reaches the unique steady state irrespective of the initial power distribution.

The strategies $\mathbb{C}_t$ and $\mathbb{E}_t$ are subject to the following constraints. To model patronage politics, discussed in the Introduction, I assume in equation (3) that the consumption of a clan is limited by its de facto power times output.

$$0 \leqslant C_t^i \leqslant P_t^i Y_t \qquad \forall i \in \mathcal{N} \tag{3}$$

This constraint expresses the idea that political actors need some influence to appropriate resources. Influence or power can be interpreted by any position or office that presents the possibility to its holder to affect the redistribution of the gains. Even if the most important ones are the seats in the ministerial cabinet, as mentioned in Francois et al. (2015), I use a broader definition including key positions in governmental or private organisations. The ethnic groups compete for these posts because of the benefits associated with them.

The ethnic groups of the model allocate their time between two activities, providing labour and exerting a political effort. Due to these definitions, the demographic share of a group puts an upper-bound on its political effort, expressed in equation (4):

$$0 \leqslant E_t^i \leqslant n_t^i \qquad \forall i \in \mathcal{N} \tag{4}$$

Equation (5) gives the total labour available in the economy at time $t + 1$, which is equal to the proportion of politically inactive people in the previous period.

$$L_{t+1} = 1 - \sum_{i \in \mathcal{N}} E_t^i. \tag{5}$$

The typical trade-off between appropriative and productive activities appears in equation (5). A group that contributes to the joint labour supply has to lower its political effort, which will decrease

preferences for themselves in the present and in the future. However, Sudgen (1998, 2007) argues that the preferences of individuals change over time and that their present and future interests sometimes diverge. Therefore, equation (2) is a sensible representation of the preferences of competing ethnic groups. If Sugden's theory demonstrates some validity at the individual level, it can be accepted conveniently for ethnic groups composed of many individuals with uncertain life expectancies, in the context where the future state depends on an equilibrium among many participants.

its influence share at the expense of the other groups.[10] The timing of equation (5) reflects the arbitrage that the agents must make concerning the current time endowment, between either the appropriation or the production of the future output. This timing corresponds to the situation where the fruits of labour are harvested at the end of the period, as in agriculture. Formally, the present assumption imposes a strong separation between productive labour and political activism. Nonetheless, it tolerates that people engage in multiple activities in reality. In fact, an interpretation that would lead to the same model is that the strategies capture the proportion of time devoted to each activity by the members of the ethnicity on average. As a consequence, relaxing this assumption would preserve the results.

A possible extension to consider is a third trade-off, between leisure and the other activities. I reject this pathway because it obscures the message of the present paper and its causal mechanisms, by giving up the closed-form solutions and forcing an entirely numerical approach. Also, in many developing countries, a large proportion of the youth is unemployed, interpreting (4) strictly in terms of time available for labour or leisure less relevant than in advanced economies. By simply adopting a broader interpretation of capabilities without restrictions on leisure, failing to introduce it becomes less harmful to the validity of the assumptions of the model.

The state variables of this model are K_t, the capital stock and $\mathbb{P}_t$, the $N \times 1$ vector of de facto power shares with typical element P_t^i and I define here how the consumption and political effort strategies affect their evolution. The capital stock of the next period, expressed in equation (6), is equal to current output minus total consumption. Full depreciation of capital is assumed.

$$K_{t+1} = Y_t - \sum_{i \in \mathcal{N}} C_t^i \tag{6}$$

Equation (6) summarises the other basic trade-off faced by the agents of this model. Consumption increases utility because of the taste for present consumption but decreases it because of the capital stock reduction it induces, given the taste for transfers.

Furthermore, the law of motion of power is

$$P_{t+1}^i = P_t^i + \gamma \left(E_t^i \, (1 - P_t^i) - \left(\sum_{j \in \mathcal{N} \setminus \{i\}} E_t^j \right) P_t^i \right) \qquad \forall i \in \mathcal{N} \tag{7}$$

The parameter γ, $0 < \gamma < 1$, captures the intensity of the appropriative competition. Two relevant interpretations of this parameter are the degree of resource dependence of the economy, and the level of institutional constraints on the executives. Arguably, natural resources create rents that are easy to capture by the state and other interest groups (Collier and Hoeffler, 2004; Tsui,

[10] See equation (7) below.

2011). Here, the marginal effect of the political effort on the change in influence share is proportional to this parameter. Therefore, I interpret an increase of γ as a greater appropriative contest intensity, possibly caused by the presence of natural resource wealth. Indeed, when the oil sector gains importance in the economy, for instance, less effort is required to control an equivalent fraction of national income, because these revenues are easier to appropriate than the average. The patronage system is also stronger on all tiers of society making lobbying efforts more efficient in the appropriation of the rents. More generally, it could mean that institutions protecting property rights and judicial system norms are weak and thus fail to dissuade corruptive practices. Consequently, engaging in rent-seeking activities involves few risks, and comparable levels of effort produce larger gains.

The idea behind this equation is that agent i exerts effort to take away influence from all the other groups proportionally, which appears in the term $E_t^i \ (1 - P_t^i)$. The term minus $\left(\sum_{j \in \mathcal{N} \setminus \{i\}} E_t^j\right) P_t^i$ is the loss of influence of agent i resulting from the efforts of all other groups. Because $0 < \gamma < 1$, $E_t^i < 1$ and $\sum_{j \in \mathcal{N} \setminus \{i\}} E_t^j < 1$, a convenient property of this law of motion is that influence shares necessarily remain between zero and unity.

With a broad concept of influence, the law of motion (7) is a natural assumption to adopt. I conceptualise power as a continuous variable because all important positions in state and private organisations confer authority, beyond seats in the government cabinet. This assumption thus well conveys the idea that efforts are carried out to gain access to these positions. A group with a small influence has few positions to lose. Its influence drop, $\left(\sum_{j \in \mathcal{N} \setminus \{i\}} E_t^j\right) P_t^i$ is thus small because it contains the factor P_t^i, close to 0. In comparison, a dominant group has many positions to lose. Its influence drop $\left(\sum_{j \in \mathcal{N} \setminus \{i\}} E_t^j\right) P_t^i$ is thus large because it contains the factor P_t^i, close to 1. The conclusions obtained by looking at the gains $E_t^i \ (1 - P_t^i)$ coincide with this analysis. Equation (7) encloses a symmetry assumption where all sides are treated anonymously in the contest. This assumption is good with few tactical interactions between the positions, a valid case in this macroeconomic environment.

Finally, I make the following assumption on the parameter values, which is needed to discard situations where the political contest is inactive and where no group confronts its opponents with a strictly positive effort in equilibrium.

Assumption 1

$$\gamma > 1 - \alpha \tag{8}$$

As in Assumption 1, the appropriative competition coefficient γ must be larger than $1 - \alpha$, where α is capital elasticity. Indeed, when the power gains are too small, all agents can conceivably choose to maximise productive labour time at the optimum.

2.1 Equilibrium

A vector $(\mathbb{C}_t, \mathbb{E}_t)$ is a pure strategy temporary equilibrium of the model at time t, whenever each group maximises its utility function given by (2) subject to the constraints (3) and (4), by choosing C_t^i and E_t^i given $(\mathbb{C}_t^{-i}, \mathbb{E}_t^{-i})$, the strategies of all other groups. Appendix A describes the first-order conditions of this maximisation problem. By rewriting and deriving the utility function and by using the complementary slackness conditions, I obtain the best response functions

$$C_t^{i,BR}(\mathbb{C}_t^{-i}) = \min\left(\frac{Y_t - \sum_{j\in\mathcal{N}\setminus\{i\}} C_t^j}{1+\beta\alpha}, P_t^i Y_t\right) \tag{9}$$

$$E_t^{i,BR}(\mathbb{E}_t^{-i}) = \min\left(\max\left(0, \frac{\gamma - (1-\alpha+\gamma)P_t^i}{\gamma(1-P_t^i)(2-\alpha)} - \frac{\frac{1}{2-\alpha} - P_t^i}{1-P_t^i} \sum_{j\in\mathcal{N}\setminus\{i\}} E_t^j\right), n^i\right) \tag{10}$$

These expressions follow from the discussion on the value of the Karush-Kuhn-Tucker multipliers in the linear system of first-order conditions contained in Appendix A. The upper bounds are defined by the constraints (3) and (4). The lower bound of the effort strategy space is zero, formally also the lower bound of the consumption strategy space. However, with the log-utility in consumption, the best-response never reaches it, allowing to simplify further the expression. Thanks to the linearity of the first-order conditions system, the interior solutions are linear in the sum of the other players' strategies. The consumption best-response (9) is the combination of a classical investment game best-response (Dasgupta and Heal, 1979)

$$\frac{Y_t - \sum_{j\in\mathcal{N}\setminus\{i\}} C_t^j}{1+\beta\alpha}$$

i.e., the amount consumed by group i, whenever the upper-limit of constraint (3) is loose and a corner solution. The above expression is obtained by simply rearranging first-order condition (17). Its numerator, $Y_t - \sum_{j\in\mathcal{N}\setminus\{i\}} C_t^j$ is the residual of output after the consumption of all other groups. The political effort best-response (10) is a function defined in three pieces. The first-order condition yields the middle element

$$\frac{\gamma - (1-\alpha+\gamma)P_t^i}{\gamma(1-P_t^i)(2-\alpha)} - \frac{\frac{1}{2-\alpha} - P_t^i}{1-P_t^i} \sum_{j\in\mathcal{N}\setminus\{i\}} E_t^j$$

i.e., the interior solution that operates whenever constraint (4) is loose. It depends only on the parameters α and γ, the power position P_t^i of group i at time t, and the total effort made by all the other groups $\sum_{j\in\mathcal{N}\setminus\{i\}} E_t^j$. The first and last elements of (10) correspond to the lower and upper bounds of (4). Here, we have strategic substitutes in (9) and (10) in the sense that actions offset each other.

The following proposition claims that a unique equilibrium of this model exists at all periods and characterises them.

Proposition 1 *At all times* $t = 0, 1, \ldots$:

(i) A pure strategy temporary equilibrium exists.

(ii) The pure strategy temporary equilibrium is unique.

(iii) At the pure strategy temporary equilibrium,
(a.) there is a partition $\{\mathcal{S}, \mathcal{N} \setminus \mathcal{S}\}$ *of* $\mathcal{N}$ *with* $S = \#\mathcal{S}$ *such that*

$$C_t^i = \begin{cases} \frac{Y_t \sum_{j\in\mathcal{S}} P_t^j}{S+\alpha\beta} & \textit{for } i \in \mathcal{S} \\ Y_t P_t^i & \textit{for } i \in \mathcal{N} \setminus \mathcal{S} \end{cases} \tag{11}$$

(b.) and there is a partition of the groups $\{\mathcal{O}, \mathcal{M}, \mathcal{N} \setminus \mathcal{O} \setminus \mathcal{M}\}$ *of* $\mathcal{N}$ *with* $M = \#\mathcal{M}$ *such that*

$$E_t^i = \begin{cases} n^i & \textit{for } i \in \mathcal{O} \\ E_t^{i,int} & \textit{for } i \in \mathcal{M} \\ 0 & \textit{for } i \in \mathcal{N} \setminus \mathcal{O} \setminus \mathcal{M} \end{cases} \tag{12}$$

with $E_t^{i,int} = \frac{(1-\gamma)\sum_{j\in\mathcal{M}\setminus\{i\}} P_t^j + \gamma\left(1-\sum_{j\in\mathcal{O}} n^j\right) + P_t^i\left(\alpha+(2-\alpha)\gamma\sum_{j\in\mathcal{O}} n^j + \gamma(M-2)-M\right)}{\gamma\left(\sum_{j\in\mathcal{M}} P_t^j + M + 1\right)}$

The proof is in Appendix B. The existence follows straightforwardly from the fact that the best response correspondences are continuous from a closed box to itself, using Brouwer's fixed-point theorem. I prove the uniqueness result using properties on aggregative games demonstrated in Cornes and Hartley (2011).[11] The characterisation is obtained by generalising the solution of the first-order conditions system. Formally, the sets $\mathcal{S}$, $\mathcal{O}$ and $\mathcal{M}$ are time-dependent and should be denoted $\mathcal{S}_t$, $\mathcal{O}_t$ and $\mathcal{M}_t$ throughout. However, I omit these time-indices to make notation clearer.

Equation (11) encompasses the core mechanism of this paper. The equilibrium consumptions of the groups depend on the size of their influence share. The less influential groups ($i \in \mathcal{N} \setminus \mathcal{S}$) have binding constraints on their consumption (3) and employ as much as is allowed. As far as they are concerned, the stronger groups ($i \in \mathcal{S}$) determine their consumption strategically, which is identical for each of them at the equilibrium. S is the number of groups participating in this strategic interaction, which pushes up the strength of the negative externality and slows down investment. Indeed, to illustrate, if we suppose that $\mathcal{S} = \mathcal{N}$ i.e., every resource constraint is loose, then the consumption of each group would be equal to $\frac{Y_t}{N+\alpha\beta}$ and total investment to $\frac{Y_t\alpha\beta}{N+\alpha\beta}$. Evidently, the larger N is, the smaller investment

[11] These are games where the marginal payoff of a player depends only on its own strategy and the sum of the strategies of all players.

would be in this case. Such outcome is a classical result in investment games related to the 'tragedy of the commons' (Hardin, 1968). Here, the same occurs when we relax the assumption that $\mathcal{S} = \mathcal{N}$, even if the groups outside $\mathcal{S}$ already capture a fraction of output.

Readily from the solution (11), a proportional increase of the total influence held by the groups in $\mathcal{S}$ at the expense of the other groups without an induced change in the equilibrium partition leads to an increase in investment because (i) the consumption shares of the groups that invest remain unchanged while their disposable income goes up, and (ii) the remaining groups continue to consume their total disposable income, which goes down.

Equation (12) expresses the equilibrium effort strategies. The most powerful groups tend to reduce their effort because they barely have any influence to gain compared with the loss in output produced ($i \in \mathcal{N} \setminus \mathcal{O} \setminus \mathcal{M}$). The most underrepresented groups, in comparison, restrict their labour supply and have a constrained political effort at the upper bound ($i \in \mathcal{O}$). From (7), their effort is effective because they have much influence to gain. Some groups have an interior equilibrium effort ($i \in \mathcal{M}$), which depends on $\sum_{j \in \mathcal{O}} n^j$, the sum of the demographic shares of the groups engaging fully in the contest, their own influence share and the sum of the influence shares ($\sum_{j \in \mathcal{M}} P_t^j$) and the number ($M = \#\mathcal{M}$) of groups with an interior solution.

Directly inferring the sign of the variation of a specific equilibrium effort due to a change in the value of γ from equation (12) is impossible. Still, by inspecting the interior linear best response effort in equation (10), where γ increases the intercept without changing the slope, the total effort is automatically positively linked to this parameter, as in the numerical simulations of subsection 3.2.

The model implies that underrepresented groups tend to be more active politically. The empirical evidence illustrating this consequence is scant because the phenomenon is mostly unobserved. Notwithstanding, anecdotal evidence at least bolsters it at both ends of the spectrum. For instance, Acemoglu's canonical example of eighteenth-century Barbados (Acemoglu and Robinson, 2012), a society dominated by large landowners exploiting sugar plantations and slave labour, illustrates the idea that they did not need to increase further their influence. The objective of this elite class was to conserve the status quo and to maximise the output of their land. At the other extreme, the immolation of the poor street vendor Mohammed Bouazizi, the event considered the spark that ignited the Arab Spring, demonstrates how disenfranchised individuals who lack prospects are capable of almost anything.

To elaborate on this idea, I produce a short empirical enquiry using the Reputation of Terror Groups dataset from Tokdemir and Akcinaroglu (2016). This dataset contains information on terror groups that claim to represent the interest of excluded people. Table I is a frequency table on a variable denoting whether the group is politically active, i.e., has a political wing, and on the size of the organisation, i.e., categories of the number of active members. Additionally, this table indicates that organisations with an ethno-nationalist motive in the sample tend to be more politically active and larger than the others. The estimation results of Probit models in Table II support such speculation. These equations, estimated with standard maximum likelihood methods, have year fixed-effects plus controls for institutions, GDP and population at the country level in columns (2) and (4) and the standard errors are robust. The coefficient of the variable *Ethno-Nationalist Motive* is positive and significant in these estimations pinpointing that the size and political activism of this category are greater than the rest.

2.2 Steady State

Knowing the partitioning sets $\mathcal{S}$, $\mathcal{M}$ and $\mathcal{O}$, Proposition 1 would completely describe the equilibrium in closed-form. In practice, however, these sets are unknown a priori. Still, I can always compute the equilibrium values of particular cases by iterating the best-response correspondences that converge to the equilibrium thanks to the concavity of the game. Then, the time path of state variables stems from the laws of motions (6) and (7). Regarding this, the following proposition states that the power dynamics reaches a unique steady state in the long run.

Proposition 2 *(i) There exists a steady state of the power dynamics defined by equation (7).*

(ii) This steady state is unique.

(iii) There is a partition of the groups $\{\mathcal{Q}, \mathcal{N} \setminus \mathcal{Q}\}$ of $\mathcal{N}$ with $Q = \#\mathcal{Q}$ such that

$$P^i_{ss} = \begin{cases} \frac{1}{Q}\frac{\varphi-\sqrt{\varphi^2-4\gamma Q(1-\alpha+\gamma)\left(1-\sum_{j\notin\mathcal{Q}} n^j\right)}}{2(1-\alpha+\gamma)} & \textit{for } i \in \mathcal{Q} \\ \frac{n^i}{\sum_{j\notin\mathcal{Q}} n^j}\frac{\varphi+\sqrt{\varphi^2-4\gamma Q(1-\alpha+\gamma)\left(1-\sum_{j\notin\mathcal{Q}} n^j\right)}}{2(1-\alpha+\gamma)} & \textit{for } i \in \mathcal{N}\setminus\mathcal{Q} \end{cases}$$

where $\varphi = 1-\alpha+\gamma\left(Q+1-\sum_{j\notin\mathcal{Q}} n^j\right)$

and

$$E^i_{ss} = \begin{cases} \frac{\psi-\sqrt{\psi^2-4\gamma^2 Q(Q-1)(\sum_{j\notin\mathcal{Q}} n^j)(\sum_{j\notin\mathcal{Q}} n^j-1)}}{2(Q-1)Q\gamma} & \textit{for } i \in \mathcal{Q} \\ n^i & \textit{for } i \in \mathcal{N}\setminus\mathcal{Q}. \end{cases} \tag{13}$$

where $\psi = 2-\alpha+\gamma((2Q-1)(\sum_{j\notin\mathcal{Q}} n^j)-Q)$

The proof of this proposition is in Appendix C. As in the previous existence result, Proposition 2.(i) follows from the continuity of the influence dynamics correspondence from a simplex to itself and Brouwer's fixed-point theorem. Uniqueness here is slightly less simple to demonstrate and follows essentially from the first-order conditions. Proposition 2.(iii) is the solution of the system of first-order conditions at the steady state.

Part (iii) of the proposition expresses the steady-state efforts, and influence shares, again distinguishing between constrained ($i \in \mathcal{N} \setminus \mathcal{Q}$), and unconstrained groups ($i \in \mathcal{Q}$). An important element is that all groups have strictly positive efforts at the steady state. The groups in $\mathcal{N} \setminus \mathcal{Q}$ make a political effort equal to n^i, and their steady-state influence is proportional to that. The groups in $\mathcal{Q}$ make an interior political effort, and their steady-state influence share is equal to their portion in the total political effort. Steady-state efforts and influence shares are the same across all these unconstrained groups.

Because influence shares and labour strategies are unique at the steady state, the investment rate, symbolised here by I_{ss} is also unique at this stage. Consequently, the capital accumulation dynamics defined by (6) leads to a unique steady state characterised by a level of output Y_{ss}. Proposition 3 formalises this.

Proposition 3 *There exists a unique steady state of the capital accumulation defined by equation (6) characterised by a level of output*

$$Y_{ss} = \left(A(I_{ss})^{\alpha}(L_{ss})^{1-\alpha}\right)^{\frac{1}{1-\alpha}} \tag{14}$$

where I_{ss} is the investment share at the steady state of the power dynamics and L_{ss} is the labour supply at the steady state.

The proof is in Appendix D. The mechanism of this paper appears more clearly in equation (14). The discussion above has highlighted that an increase in appropriative competition intensity γ tends to have a negative effect on L_{ss} and a positive effect on I_{ss}. A priori, the sign of the balance of these two effects is unidentified. In the next section, I show via a counter-example that γ may affect Y_{ss} positively, even if this is a rare outcome.

3 Numerical Analysis

The various non-linearities between the parameters, the steady-state efforts and influence shares require numerical simulations to study the impact of γ, the parameter capturing the intensity of the appropriative contest, on steady-state output. I explain in subsection 3.1 how I proceed to obtain calibrated values of the model parameters for a global sample of 93 countries under different scenarios. In subsection 3.2, I carry out a comparative statics experiment where I change the value of γ.

3.1 Calibration

In this subsection, I describe how parameter values are reached, which associate model outcomes with counterparts in the data. I use a sample of 93 ethnically divided countries present in the Ethnic Power Relations database (Vogt et al., 2015).[12] I take the n^i's, the ethno-demographic shares from this source. In each country, I identify $\mathbb{P}_{ss}$ after computing the equilibrium strategies by iterating the best-response correspondence and the law of motion of influence (7) for many periods until convergence. Proposition 1 and formula (14) then allow calculating the steady-state revenue.

To produce the simulated path, I choose three values for the capital share parameter,

$$\alpha \in \{0.3, 0.5, 0.7\}.$$

I leave the parameter space of α unrestricted, letting it move away from 0.3, the value generally admitted for this parameter, because the present model differs in many aspects from more traditional models and because the context is different on many levels. I prefer to remain agnostic and to investigate with values spread over the [0,1] interval. Initially, I set the parameter γ at $\gamma_0 = 0.85$, and vary it later. Thanks to this choice, I can easily adjust γ without reaching the thresholds at 1 and $1 - \alpha$ imposed by Assumption 1.

Using the Penn World Tables version 9.0 (Feenstra et al., 2015), I construct a proxy for the steady-state investment as a share of GDP by taking the average of this series across all years for each country. To agree with the model as best as possible, I reconstruct GDP as the sum of consumption and investment using the series *Real domestic absorption* and *Real consumption of households and government*. I set the value of β for each country to match the calculated values with their data counterparts.

Similarly, long-run means of the real GDP per capita series, again reconstructed as the sum of consumption and investment, produce the steady-state GDP proxy. I set the value of A, total factor productivity, for each country in the sample so that the simulated model concurs with the data. I thus obtain A_c and β_c for each country and each value of $\alpha \in \{0.3, 0.5, 0.7\}$.

Table I reports descriptive information on the results of this procedure. β represents the discount factor of the model of the present paper. Even if this coefficient is usually below one in macroeconomic models, I relaxed this assumption in section 2 because of the association in the utility function (2) with the logarithm of $P^i_{t+1}Y_{t+1}$, the resources available to group i for its consumption and investment in the following period. The rather large reported values for the parameter A relate to the assumptions on population, which is normalised to one and on the depreciation rate, equal to one. In any case, these calibrated values constitute a base for the numerical comparative statics experiment performed below

[12] Because the present mechanism occurs with weak institutions, I exclude the countries with an average Polity score above 9 on the post-1960 period. These are Australia, Austria, Belgium, Bosnia, Canada, Costa Rica, Cyprus, Finland, France, Israel, Italy, Japan, Lithuania, Mauritius, New Zealand, Slovenia, Switzerland, United Kingdom and United States.

rather than a result per se.

3.2 Comparative Statics

In this subsection, I report numerical simulations, assessing the comparative effect of γ, the parameter capturing the intensity of the appropriative competition, on steady-state GDP. I consider small changes of γ that respect Assumption 1. In each country and for each $\alpha \in \{0.3, 0.5, 0.7\}$, I compute the value of $Y_{ss,0}$, the steady-state GDP of the model at $\gamma = \gamma_0 = 0.85$. I then shift γ to $\gamma_0 + \Delta\gamma$ for $\Delta\gamma$ between -0.05 and $+0.05$ in steps of 0.01 and compute the corresponding output Y_{ss} every time.

Figure I plots the ratio

$$\frac{Y_{ss}}{Y_{ss,0}}$$

against $\Delta\gamma$ in separated panels for each country. To distinguish the three scenarios, the grey dashed lines, dark dashed lines and solid lines are for $\alpha = 0.3$, $\alpha = 0.5$, and $\alpha = 0.7$, respectively.

γ affects Y_{ss} through two different channels. The first operates through the steady-state political efforts and is negative. The numerical simulations confirm the intuition that increasing the marginal efficiency of rent-seeking reinforces its prevalence in equilibrium. A second channel exists, operating through the steady-state power configuration, $\mathbb{P}_{ss}$ and the resulting steady-state investment share in GDP, I_{ss}, which sometimes has a positive effect. This mechanism, summarised in equation (11) and detailed in the previous section flows from a reduction of the free-rider problem by the concentration of power at the steady state.

Figure I confirms that the first effect tends to dominate. Even if this effect could be absent if all groups have a loose consumption constraint (3), the second effect can theoretically outweigh the first as demonstrated by the cases listed in Tables IV, V and VI, which show the names of the majoritarian groups and their relative size in the countries where $\frac{\partial Y_{ss}}{\partial \gamma} > 0$, i.e., the slope of steady-state income with respect to γ is positive. Table IV features the countries that fulfil this condition for $\alpha = 0.7$. The countries of Table IV fulfil this condition for two scenarios $\alpha = 0.5$ and $\alpha = 0.7$, and those of Table VI, for $\alpha = 0.3$, $\alpha = 0.5$ and $\alpha = 0.7$. One reason why such a phenomenon is more likely for larger values of α is that this makes the slope of I_{ss} steeper and the slope of L_{ss} flatter in the Y_{ss} relation i.e., equation (14). Thus, a larger value of α magnifies the possible positive effect and reduces the negative effect. Notably, the countries in Table VI are characterised by large ethnic majorities, a condition necessary to observe this positive effect because it works through the investment of those dominant groups.

4 Conclusion

Many developing countries in Africa, the Middle East and Latin America have at their disposal an unequalled abundance of wealth originating from their natural resources, but often in parallel with a weak institutional environment. Whether this has been good or bad in economic terms is an open question, and the debate on the resource curse remains. Furthermore, these political regimes are often less open than in advanced economies, and their populations are rarely homogeneous, but rather composed of competing factions. Regarding this issue, the general message of international development agencies, such as the World Bank or the International Monetary Fund, is to promote inclusive institutions and democracy. Still, whether this will have a favourable impact on the economy in all circumstances remains unclear.

To provide answers to this type of enquiry, I constructed a macroeconomic growth model with an appropriative contest between politically organised ethnic factions. A voluminous literature on ethnic politics and clientelism, two problems arguably relevant for the countries under consideration, inspired such a modelling strategy. I characterised the equilibrium strategies of consumption and political effort and demonstrated the uniqueness in this case. Subsequently, I showed the existence and uniqueness of a steady state, described by the political influence configuration of the groups and the limiting level of output.

In particular, I examined in detail the role played by the appropriative competition intensity on long-run wealth. Even if it seems a priori that the economic consequences of an increase of this parameter should be detrimental, I established on the contrary, theoretically and via simulations, that this may be untrue under certain circumstances by uncovering a mechanism operating through the steady-state power configuration and the investment rate. Essentially, when the competition intensity increases, the dominant groups have an incentive to expand their influence, while the minority groups, for their part, are unable to respond profitably to this change because they are already at the corner in their political strategy space. Because the dominant groups contribute the most to the common investment, the result is a boosted rate of capital accumulation that contributes to a greater productive capacity in the future.

Using a calibrated model for 93 countries, I showed, with a numerical counter-example, that this positive effect could conceivably prevail over the negative one caused by appropriation. The results indicate that this would be the case in countries with large ethnic majorities like Mali, Paraguay, or Egypt, if the capital elasticity coefficient is sufficiently large.

In connection with the Lipset modernisation hypothesis, a broader implication of this result is that these countries could be better-off in the long run with a strong central state, which efficiently redistributes public revenues to the population in the form of education spending and infrastructure. Democratisation prospects would be better in this respect than an unorganised and counter-productive scramble for rents. Eventually, a peaceful democratic transition could be more likely in these countries once they have acquired sufficient capabilities to build the institutions of a well-functioning open state, to guarantee a fair and efficient repartition of the nation's wealth.

Finally, further research would integrate asymmetries in the analysis. For instance, assessing the welfare consequences for the minorities of efficiency gains in the technology of conflict favourable to the majority could be an achievable project.

5 Appendix

A : First Order Conditions

By substituting (5), (6) and (7), the utility function (2) becomes

$$\begin{aligned} U_t^i(\mathbb{C}_t, \mathbb{E}_t) &= \beta \log(A) + \log(C_t^i) + \beta\alpha \log\left(Y_t - \sum_{j\in\mathcal{N}} C_t^j\right) \\ &+\beta(1-\alpha)\log\left(1 - \sum_{j\in\mathcal{N}} E_t^j\right) \\ &+\beta \log\left(P_t^i + \gamma\left(E_t^i\ (1-P_t^i) - \left(\sum_{j\in\mathcal{N}, j\neq i} E_t^j\right) P_t^i\right)\right) \end{aligned} \tag{15}$$

A vector $(\mathbb{C}_t, \mathbb{E}_t)$ is a pure strategy temporary equilibrium of the model at time t whenever each group maximises its utility function given by (15) subject to the constraints (3) and (4) by choosing C_t^i and E_t^i given $(\mathbb{C}_t^{-i}, \mathbb{E}_t^{-i})$, the strategies of all other groups. The Lagrangian of the maximisation problem of group i is

$$\mathcal{L}(\mathbb{C}_t, \mathbb{E}_t, \boldsymbol{\mu}^i) = U_t^i(\mathbb{C}_t, \mathbb{E}_t) - \mu_1^i C_t^i + \mu_2^i(C_t^i - P_t^i Y_t) - \mu_3^i E_t^i + \mu_4^i(E_t^i - n^i) \tag{16}$$

where $\boldsymbol{\mu}^i = (\mu_1^i, \mu_2^i, \mu_3^i, \mu_4^i)$ is the vector of Karush-Kuhn-Tucker multipliers for the inequality constraints (3) and (4).

The first-order necessary conditions are

$$\frac{\partial\mathcal{L}}{\partial C_t^i} = 0 \tag{17}$$

$$\frac{\partial\mathcal{L}}{\partial E_t^i} = 0 \tag{18}$$

$$0 \leqslant C_t^i \leqslant P_t^i Y_t \tag{19}$$

$$0 \leqslant E_t^i \leqslant n^i \tag{20}$$

$$\mu_k^i \geqslant 0 \quad \text{for } k = 1,2,3,4 \tag{21}$$

$$\mu_1^i C_t^i = \mu_2^i(C_t^i - P_t^i Y_t) = \mu_3^i E_t^i = \mu_4^i(E_t^i - n^i) = 0 \tag{22}$$

Setting $\mu^i = 0$ in these equations and solving for C_t^i and E_t^i gives the interior optimal strategies

$$C_t^{i,Int} = \frac{Y_t - \sum_{j \in \mathcal{N}, j \neq i} C_t^j}{1 + \beta\alpha} \tag{23}$$

$$E_t^{i,Int} = \frac{\gamma - (1 - \alpha + \gamma)P_t^i}{\gamma(1 - P_t^i)(2 - \alpha)} - \frac{\frac{1}{2-\alpha} - P_t^i}{1 - P_t^i} \sum_{j \in \mathcal{N}, j \neq i} E_t^j \tag{24}$$

Taking into account the complementary slackness conditions (22) allows writing an expression for the best-response functions.

B : Proof of Proposition 1

(i) Define the strategy spaces

$$\begin{aligned} \mathcal{V}_t &= [0, P_t^1 Y_t] \times \ldots \times [0, P_t^j Y_t] \times \ldots \times [0, P_t^N Y_t] \\ \mathcal{W}_t &= [0, n^1] \times \ldots \times [0, n^j] \times \ldots \times [0, n^N]. \end{aligned}$$

The best-response mappings $\mathbb{C}_t^{BR} : \mathcal{V}_t \to \mathcal{V}_t$ and $\mathbb{E}_t^{BR} : \mathcal{W}_t \to \mathcal{W}_t$ are continuous. Brouwer's fixed-point theorem implies the existence of an equilibrium. (ii) To demonstrate uniqueness, I consider that this game is equivalent to two separate well-behaved aggregative games where the marginal payoff of a player depends only on its own strategy and the sum of the strategies of all players (Cornes and Hartley, 2011; Acemoglu et al., 2015). The utility function (15) can be rewritten as

$$U_t^i(\mathbb{C}_t, \mathbb{E}_t) = \beta \log(A) + v^i(x^i, X) + w^i(z^i, Z)$$

where

$$v^i(x^i, X) = \log(x^i) + \beta\alpha \log(Y_t - X)$$

and

$$w^i(z^i, Z) = \beta(1 - \alpha) \log(1 - Z) + \beta \log(P_t^i + \gamma z^i - \gamma Z)$$

$x^i = C_t^i$ and $z_t^i = E_t^i$ are the own strategies of agent i and $X = \sum_{j \in \mathcal{N}} C_t^j$ and $Z = \sum_{j \in \mathcal{N}} E_t^j$ are the sum of the strategies over all players. I show that v^i and w^i fulfil the sufficient conditions for uniqueness of Cornes and Hartley (2011).

The marginal payoff ensuing from v^i is $\eta^i = \frac{dv^i}{dx^i} = \frac{\partial v^i}{\partial x^i} + \frac{\partial v^i}{\partial X}$. The sufficient conditions are that the marginal payoff has negative partial derivatives with respect to its arguments i.e., $\frac{\partial \eta^i}{\partial x^i} < 0$ and $\frac{\partial \eta^i}{\partial X} < 0$ whenever $x^i < X$ and $\eta^i = 0$.

$$\begin{aligned} \eta^i &= \frac{1}{x^i} - \frac{\beta\alpha}{Y_t - X} \\ \frac{\partial \eta^i}{\partial x^i} &= -\frac{1}{{x^i}^2} < 0 \\ \frac{\partial \eta^i}{\partial X} &= -\frac{\beta\alpha}{(Y_t - X)^2} < 0 \end{aligned}$$

The same is true for w^i and ω^i, using the condition $\omega^i = 0$ to reduce the derivative with respect to Z.

$$\begin{aligned} \omega^i &= \frac{P_t^i(1 - \alpha + \gamma - (2 - \alpha)\gamma Z) + \gamma(1 - (1 - \alpha)z^i - Z)}{(1 - Z)(P_t^i(1 - \gamma Z) + \gamma z)} \\ \frac{\partial \omega^i}{\partial z^i} &= -\frac{(1 - P_t^i)\gamma}{(P_t^i + z^i\gamma - P_t^i Z\gamma)^2} < 0 \\ \frac{\partial \omega^i}{\partial Z} &= -\frac{(1 - P_t^i)\gamma(P_t^i(1 - \gamma) + z\gamma)}{(1 - Z)(P_t^i + z^i\gamma - P_t^i Z\gamma)^2} < 0 \end{aligned}$$

(iii) The equilibrium strategies are the solution of the systems

$$F_t \mathbb{C}_t = c_t$$
$$G_t \mathbb{E}_t = d_t$$

where F_t is a $N \times N$ matrix with elements

$$f_{i,j} = \begin{cases} 1 & \text{for } i = j \\ \frac{1}{1+\beta\alpha} & \text{for } i \neq j, i \in \mathcal{S} \\ 0 & \text{for } i \neq j, i \notin \mathcal{S} \end{cases} \tag{25}$$

and c is $N \times 1$ column vector with elements

$$c_i = \begin{cases} \frac{P_t^i Y_t}{1+\beta\alpha} & \text{for } i \in \mathcal{S} \\ P_t^i Y_t & \text{for } i \notin \mathcal{S} \end{cases} \tag{26}$$

G_t is a $N \times N$ matrix with elements and

$$g_{i,j} = \begin{cases} 1 & \text{for } i = j \\ \frac{\frac{1}{2-\alpha} - P_t^i}{1 - P_t^i} & \text{for } i \neq j, i \in \mathcal{M} \\ 0 & \text{for } i \neq j, i \notin \mathcal{M} \end{cases} \tag{27}$$

and c is $N \times 1$ column vector with elements

$$d_i = \begin{cases} \frac{\gamma - (1-\alpha+\gamma)P_t^i}{\gamma(1-P_t^i)(2-\alpha)} & \text{for } i \in \mathcal{M} \\ n^i & \text{for } i \in \mathcal{O} \\ 0 & \text{for } i \notin \mathcal{M} \cup \mathcal{O} \end{cases} \tag{28}$$

The matrices F_t and G_t are non-singular, and the solutions to these systems are $F_t^{-1} c_t$ and $G_t^{-1} d_t$, expressed in Proposition 1 (iii).

C : Proof of Proposition 2

(i) Define the mapping

$$\mathcal{P} : \Delta^{N-1} \rightarrow \Delta^{N-1}$$
$$\mathcal{P}(\mathbb{P}_t) = \mathbb{P}_{t+1}(\mathbb{E}_t(\mathbb{P}_t), \mathbb{P}_t)$$

Δ^{N-1} is the unit simplex of dimension N-1, $\{(P^1, \ldots, P^N) \mid \sum_{i \in \mathcal{N}} P^i = 1 \text{ and } P^i \geqslant 0 \text{ for all } i\}$. $\mathbb{E}_t(\mathbb{P}_t)$ is the equilibrium effort function defined in Proposition 1 (iii), and $\mathbb{P}_{t+1}(\mathbb{E}_t, \mathbb{P}_t)$ is the law of motion of power, in stacked vector form. These two functions are continuous. Consequently , the mapping $\mathcal{P}$ is continuous and the existence of a steady state is guaranteed by Brouwer's fixed-point theorem. (ii) I prove (iii) before (ii). (iii) At the steady state of the power dynamics, $\mathbb{P}_{t+1}(\mathbb{E}_t, \mathbb{P}_t) = \mathbb{P}_t$. I first demonstrate that $E_{ss}^i > 0 \, \forall i$. If $E_{ss}^j = 0$ for some j then $E_{ss}^i = 0 \, \forall i$ otherwise $P_{t+1}^j < P_t^j$ and this is not a steady state. $E_{ss}^i = 0 \, \forall i$ is impossible because the intercept of the best-response function (24) is strictly positive for at least some i.

$\frac{\gamma-(1-\alpha+\gamma)P_t^i}{\gamma(1-P_t^i)(2-\alpha)} > 0$ is equivalent to $P_t^i < \frac{1}{1+\frac{1-\alpha}{\gamma}}$ which must necessarily be true for a least some i because $\frac{1}{2} < \frac{1}{1+\frac{1-\alpha}{\gamma}}$, under Assumption 1 and it is not possible to have more than one group with a majority de facto power share, obviously.

Consequently, using (13), E_{ss}^i is either the interior value (24) if $i \in \mathcal{Q}$ or n^i if $i \notin \mathcal{Q}$. I demonstrate that there are $\bar{E}_{ss}$ and $\bar{P}_{ss}$ such that $E_{ss}^i = \bar{E}_{ss}$ and $P_{ss}^i = \bar{P}_{ss}$ for all $i \in \mathcal{Q}$ i.e., at the steady state, all efforts and power shares of the groups whose efforts are not constrained are equal.

If there are $k, l \in \mathcal{Q}$ such that $P^k_{ss} < P^l_{ss}$, using the steady-state condition $P^i_{t+1} = P^i_t$ for all $i \in \mathcal{Q}$ gives

$$P^i_{ss} = \frac{E^i_{ss}}{\sum_{j \notin \mathcal{Q}} n^j + \sum_{j \in \mathcal{Q}} E^j_{ss}} \tag{29}$$

Thus $E^k_{ss} < E^l_{ss}$.

The first-order condition of (15) with respect to E^i_t, expressed at the steady state gives, after rearranging and simplification,

$$(1-\alpha)\gamma E^i_{ss} + P^i_{ss}\left((2-\alpha)(1-\gamma\sum_{j\in\mathcal{N}} E^j_{ss})\right) - \gamma(1-\sum_{j\in\mathcal{N}} E^j_{ss}) = 0 \tag{30}$$

($\sum_{j\in\mathcal{N}} E^j_{ss}$ is constant if the index i changes from k to l.) If this condition is true for $i = k$, then it is violated for $i = l$ as $(1-\alpha)\gamma > 0$ and $(2-\alpha)(1-\gamma\sum_{j\in\mathcal{N}} E^j_{ss}) > 0$, the left hand side would be strictly positive.

Solving for $\bar{E}_{ss}$ in (29), I obtain $\bar{E}_{ss} = \frac{\bar{P}_{ss}\sum_{j\notin\mathcal{Q}} n^j}{1-Q\bar{P}_{ss}}$ because $\sum_{j\in\mathcal{Q}} E^j_{ss} = Q\bar{E}_{ss}$. Substituting this expression in (30) gives

$$Q(2-\alpha)\bar{P}^2_{ss} - \left(2-\alpha+(Q-\sum_{j\notin\mathcal{Q}} n^j)\gamma\right) + \gamma(1-\sum_{j\notin\mathcal{Q}} n^j) = 0$$

Using the restriction, $Q\bar{P}_{ss} \leqslant 1$, the unique solution to this equation is

$$\frac{\varphi - \sqrt{\varphi^2 - 4Q(2-\alpha)\gamma(1-\sum_{j\notin\mathcal{Q}} n^j)}}{2Q(2-\alpha)}$$

where $\varphi = 2-\alpha+(Q-\sum_{j\notin\mathcal{Q}} n^j)\gamma$

Substituting $\bar{P}_{ss}$ from (29) in (30) gives

$$Q(Q-1)\gamma\bar{E}_{ss} + \left(2-\alpha+\gamma((2Q-1)(\sum_{j\notin\mathcal{Q}} n^j)-Q)\right) - \gamma(\sum_{j\notin\mathcal{Q}} n^j)(1-\sum_{j\notin\mathcal{Q}} n^j) = 0$$

Using the restriction $Q\bar{E}_{ss} \leqslant 1$, the unique solution to this equation is

$$\frac{\psi - \sqrt{\psi^2 - 4\gamma^2 Q(Q-1)(\sum_{j\notin\mathcal{Q}} n^j)(\sum_{j\notin\mathcal{Q}} n^j - 1)}}{2(Q-1)Q\gamma}$$

where $\psi = 2 - \alpha + \gamma((2Q-1)(\sum_{j \notin \mathcal{Q}} n^j) - Q)$

(ii) Let's take a steady state and its partition $\mathcal{Q}$ with values $\bar{E}_{ss}$ and $\bar{P}_{ss}$.

I first demonstrate that $\inf_{i \in \mathcal{Q}} n^i \geqslant \sup_{i \notin \mathcal{Q}} n^i$.

$\forall i \in \mathcal{Q}$ it is the case that $n^i > \bar{E}_{ss}$. Let's say $\exists j \in \mathcal{N} \setminus \mathcal{Q}$ with $E^j_{ss} = n^j > \bar{E}_{ss}$ which implies that $P^j_{ss} > \bar{P}_{ss}$ using (29).

The corner condition of j is

$$\frac{\gamma}{P^j_{ss} + \gamma E^j_{ss} - \gamma P^j_{ss} \sum_{h \in \mathcal{N} \setminus \{j\}} E^h_{ss}} > \frac{1-\alpha}{1 - \sum_{h \in \mathcal{N}} E^h_{ss}} \tag{31}$$

The first-order conditions with respect to E^i_{ss} for all $i \in \mathcal{Q}$ are

$$\frac{\gamma}{P^i_{ss} + \gamma E^j_{ss} - \gamma P^i_{ss} \sum_{h \in \mathcal{N} \setminus \{i\}} E^h_{ss}} = \frac{1-\alpha}{1 - \sum_{h \in \mathcal{N}} E^h_{ss}} \tag{32}$$

Replacing the right-hand side of (31) by the left hand side of (32) gives

$$P^i_{ss}\left(1 - \gamma \sum_{h \in \mathcal{N} \setminus \{i\}} E^h_{ss}\right) + \gamma E^i_{ss} > P^j_{ss}\left(1 - \gamma \sum_{h \in \mathcal{N} \setminus \{j\}} E^h_{ss}\right) + \gamma E^j_{ss}$$

which is necessarily false because $P^i_{ss} < P^j_{ss}$, $E^i_{ss} < E^j_{ss}$ and

$$1 - \gamma \sum_{h \in \mathcal{N} \setminus \{i\}} E^h_{ss} < 1 - \gamma \sum_{h \in \mathcal{N} \setminus \{j\}} E^h_{ss}$$

This last inequality follows from $E^i_{ss} < E^j_{ss}$ and

$$1 - \gamma(\sum_{h \in \mathcal{N}} E^h_{ss}) + \gamma E^i_{ss} < 1 - \gamma(\sum_{h \in \mathcal{N}} E^h_{ss}) + \gamma E^j_{ss}$$

Starting from the steady state defined by $\mathcal{Q}$, $\mathcal{X}$ is a non-empty subset of $\mathcal{N} \setminus \mathcal{Q}$. Assuming that $\{\mathcal{Q} \cup \mathcal{X}, \mathcal{N} \setminus \mathcal{X} \setminus \mathcal{Q}\}$ corresponds to another steady state with values $\bar{E}'_{ss}$ and $\bar{P}'_{ss}$ leads to a contradiction.

For all $i \in \mathcal{X}$ the inequalities

$$\bar{E}'_{ss} < n^i < \bar{E}_{ss} \tag{33}$$

are true.

It all also true that

$$\bar{P}'_{ss} < \bar{P}_{ss} \tag{34}$$

because

$$\frac{\bar{E}'_{ss}}{(Q+X)\bar{E}'_{ss} + \sum_{j\in\mathcal{N}\setminus\mathcal{Q}\setminus\mathcal{X}} n^j} < \frac{\bar{E}_{ss}}{Q\bar{E}_{ss} + \sum_{j\in\mathcal{N}\setminus\mathcal{Q}\setminus\mathcal{X}} n^j + \sum_{j\in\mathcal{X}} n^j}$$

is equivalent to

$$Q\bar{E}'_{ss}\bar{E}_{ss} + \bar{E}'_{ss}(\sum_{j\in\mathcal{X}} n^j) + \bar{E}'_{ss}\sum_{j\in\mathcal{N}\setminus\mathcal{Q}\setminus\mathcal{X}} n^j < Q\bar{E}'_{ss}\bar{E}_{ss} + X\bar{E}'_{ss}\bar{E}_{ss} + \bar{E}_{ss}\sum_{j\in\mathcal{N}\setminus\mathcal{Q}\setminus\mathcal{X}} n^j$$

By comparing the sums to the left and right of the inequality sign, this is always true. In fact, the first terms are equal, and they simplify. The middle and third term to the left are smaller than the corresponding terms to the right because (33). From (33) and (34) for any $i \in \mathcal{X}$, a contradiction is reached. For $i \in \mathcal{X}$, the interior part of the best response function (10) has a positive intercept and a negative slope. A decrease of P^i_{ss} from $\bar{P}_{ss}$ to $\bar{P}'_{ss}$ increases the intercept and decreases the slope of (10). As the two best responses intercept at $\sum_{j\in\mathcal{N}\setminus\{i\}} E^j = \frac{1}{\gamma} > 1$, the best response corresponding to the steady state defined by $\mathcal{Q}\cup\mathcal{X}$ is above that defined by $\mathcal{Q}$. Because, in addition, $\sum_{j\in\mathcal{N}\setminus\{i\}} E^j_{ss}$ is smaller at the second steady state, i's best response is larger there. This contradicts the premises.

D : Proof of Proposition 3

Using Proposition 2, the steady-state power configuration $\mathbb{P}_{ss}$ is unique and constant, by definition. Equation (11) in Proposition 1 implies that, at $\mathbb{P}_{ss}$, the investment rate is defined by

$$\begin{aligned} I_{ss} &= 1 - \frac{\sum_{j\in\mathcal{S}} P^j_{ss}}{S+\alpha\beta} - \sum_{j\notin\mathcal{S}} P^j_{ss} \\ &= \left(\frac{S+\alpha\beta-1}{S+\alpha\beta}\right)\sum_{j\in\mathcal{S}} P^j_{ss} \end{aligned}$$

Solving for Y after substituting K from the law of motion of capital (6) expressed at the steady in the production function gives equation (14).

Table I: Political Representation and Size of Militant Organisations

	All		Ethno-Nationalist No		Ethno-Nationalist Yes	
Politics	Freq.	Percent	Freq.	Percent	Freq.	Percent
0	814	32.29	564	38.08	250	24.04
1	1,707	67.71	917	61.92	790	75.96
Large	Freq.	Percent	Freq.	Percent	Freq.	Percent
0	344	13.65	231	15.60	113	10.87
1	2,177	86.35	1,250	84.40	927	89.13
Total	2,521	100.00	1,481	100.00	1,040	100.00

Note: Frequency table for the 2,521 organisations from Tokdemir and Akcinaroglu (2016) by Ethno-Nationalist Purpose. 'Ethno-Nationalist' indicates whether the organisation has an ethno-nationalist objective. 1 means 'yes'. Large equal to 1 corresponds to organisations in size categories 2 to 4, defined by thresholds on the number of members, see Tokdemir and Akcinaroglu (2016) for the details. The time period covers 32 years between 1980 and 2011.

Table II: Probit Estimates

	Dependent Variable: Politics		Dependent Variable: Large	
	(1)	(2)	(3)	(4)
Ethno-Nationalist	0.418	0.555	0.231	0.440
	(7.69)**	(9.30)**	(3.52)**	(5.10)**
Year-FE	Yes	Yes	Yes	Yes
Country-Controls	No	Yes	No	Yes
N	2,521	2,265	2,521	2,265

Note: Effect on Political Activism and Size of Ethno-Nationalist Motive. Columns (1) and (2) present estimates of a probit model where the dependent variable is political participation. In columns (3) and (4), the dependent variable is the size category 'Large'. All columns have year fixed-effects. Additional controls for GDP, Polity are from Marshall and Jaggers (2007) and population in (2) and (4). All estimated standard errors are robust. t-ratio's in parentheses.

Table III: Calibrated Parameters

	Parameter	**Mean**	**Median**	**Min.**	**Max.**
$\alpha = 0.3$	A	774.322	576.597	102.441	3071.293
	β	1.750	1.356	.229	8.901
$\alpha = 0.5$	A	181.295	171.223	38.911	467.058
	β	1.065	.884	.138	5.297
$\alpha = 0.7$	A	37.091	37.106	10.145	82.391
	β	.737	.595	.120	3.448

Note: Descriptive information on the calibrated parameters, total factor productivity A and discount factor β. Constructed from the values of β, the discount factor, and A, total factor productivity calibrated to match the country average of real GDP per capita and investment share in output in the global sample of 93 countries for $\alpha = 0.3, 0.5, 0.7$. Data sources : the Penn World Tables (Feenstra et al., 2015). GDP is reconstructed as the sum of consumption and investment, with the series *Real domestic absorption* and *Real consumption of households and government*. The demographic shares of the ethnic groups come from the EPR (Vogt et al., 2015).

Figure I: Sensitivity analysis

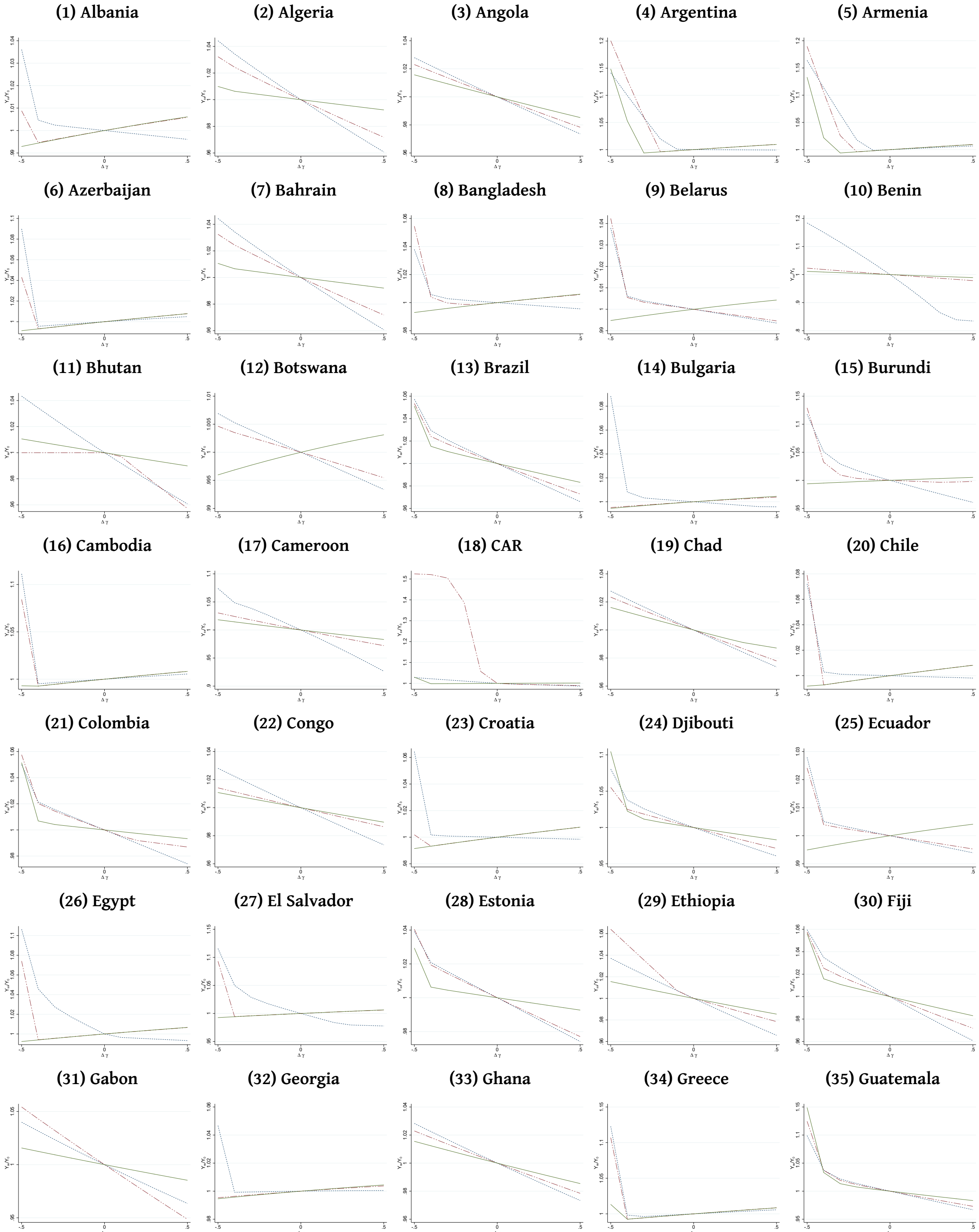


Figure I: Sensitivity analysis (continued)

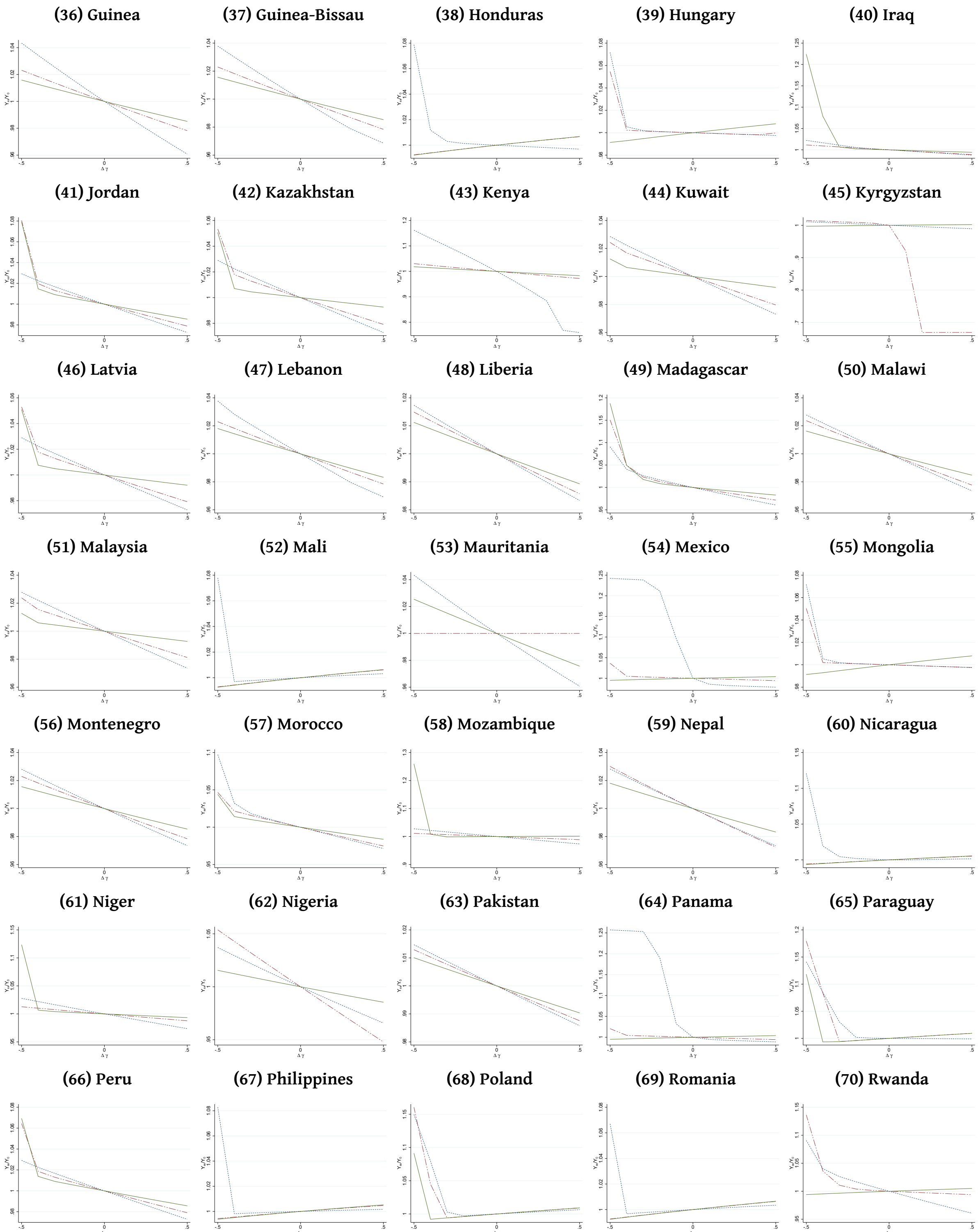
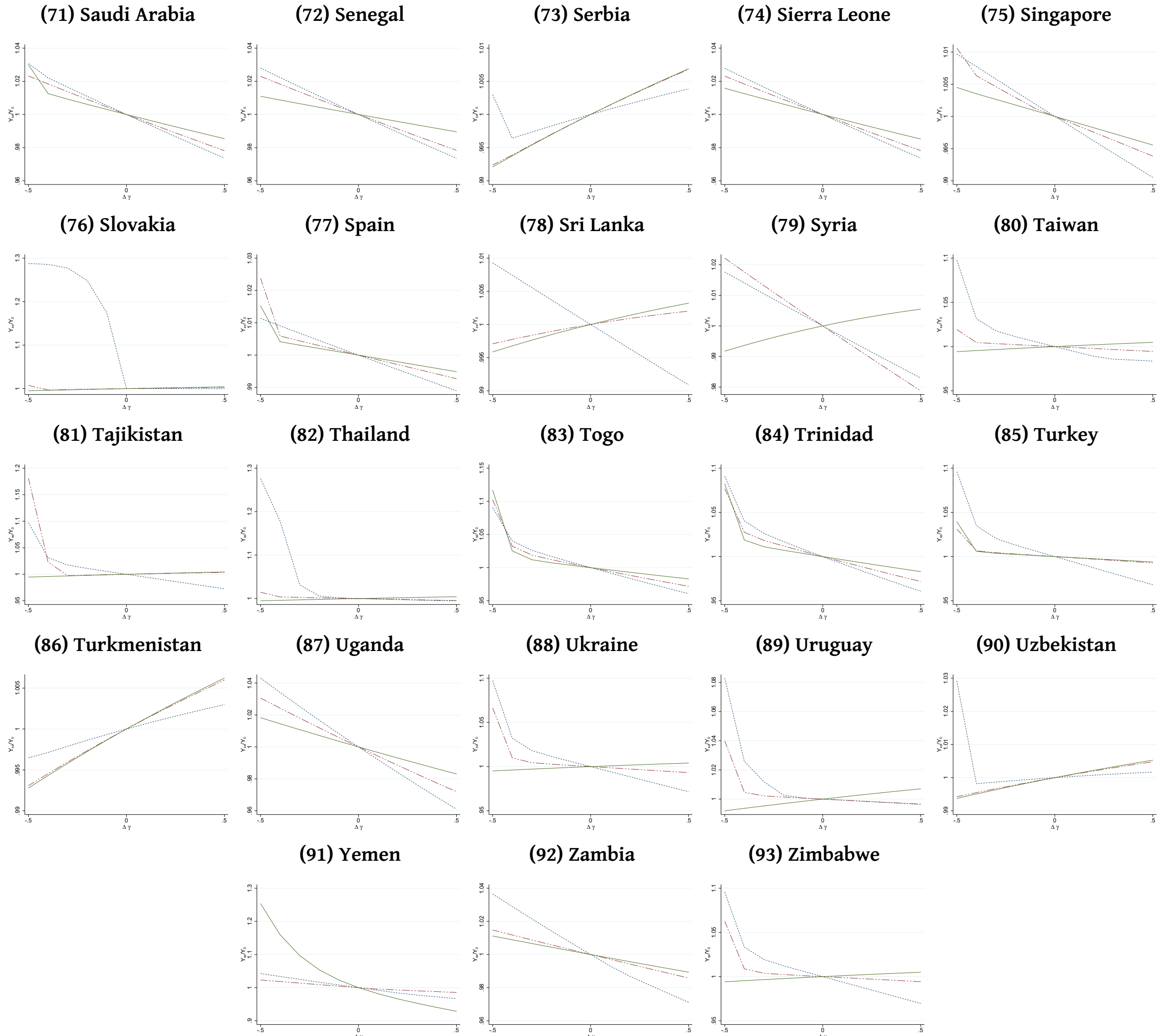


Figure I: Sensitivity analysis (continued)



Note: Effect of changes in competition intensity γ on steady-state income. The dotted lines are for $\alpha = 0.3$, the dashed-dotted lines are for $\alpha = 0.5$ and the solid lines are for $\alpha = 0.7$. Each country panel plots $\frac{Y_{ss}}{Y_{ss,0}}$, the ratio of the steady-state income at $\gamma_0 + \Delta\gamma$ to the steady-state income at γ_0 against $\Delta\gamma$ between -0.05 and 0.05.

Table IV: Majoritarian Ethnic Groups
$\frac{\partial Y_{ss}}{\partial \gamma} > 0$ **for** $\alpha = 0.7$

Country	Group Name	Relative Size
Hungary	Hungarians	0.947
Mongolia	Mongols	0.947
Uruguay	Whites & Mestizos	0.920
Burundi	Hutu	0.858
Rwanda	Hutu	0.848
Zimbabwe	Shona	0.845
Taiwan	Taiwanese	0.840
Belarus	Byelorussians	0.818
Thailand	Thai	0.815
Ecuador	Whites & Mestizos	0.810
Ukraine	Ukrainians	0.804
Mexico	Mestizos	0.801
Panama	Whites & Mestizos	0.801
Botswana	Tswana	0.756
Kyrgyzstan	Kyrgyz	0.703
Syria	Sunni Arabs	0.656
Central African Republic	Baya	0.643
Mozambique	Tsonga-Chopi	0.634

Note: This table lists the name of the majoritarian ethnic group and its relative demographic size from the Ethnic Power Relations database (Vogt et al., 2015), for the countries where $\frac{\partial Y_{ss}}{\partial \gamma} > 0$ for $\alpha = 0.7$

Table V: Majoritarian Ethnic Groups
$\frac{\partial Y_{ss}}{\partial \gamma} > 0$ for $\alpha = 0.5$ and 0.7

Country	Group Name	Relative Size
Argentina	Whites & Mestizos	0.984
Paraguay	Whites & Mestizos	0.979
Chile	Whites & Mestizos	0.952
Croatia	Croats	0.936
Honduras	Whites & Mestizos	0.913
Egypt	Arab Muslims	0.910
El Salvador	Whites & Mestizos	0.900
Albania	Albanians	0.891
Bangladesh	Bengali Muslims	0.888
Nicaragua	Whites & Mestizos	0.871
Bulgaria	Bulgarians	0.830
Tajikistan	Tajik	0.821
Slovakia	Slovaks	0.806
Sri Lanka	Sinhalese	0.762

Note: This table lists the name of the majoritarian ethnic group and its relative demographic size from the Ethnic Power Relations database (Vogt et al., 2015), for the countries where $\frac{\partial Y_{ss}}{\partial \gamma} > 0$ for $\alpha = 0.5$ and 0.7

Table VI: Majoritarian Ethnic Groups
$\frac{\partial Y_{ss}}{\partial \gamma} > 0$ **for** $\alpha = 0.3, 0.5$ **and** 0.7

Country	Group Name	Relative Size
Armenia	Armenians	0.981
Poland	Poles	0.974
Greece	Greeks	0.960
Italy	Italians	0.959
Cambodia	Khmer	0.953
Azerbaijan	Azeri	0.942
Serbia	Serbs	0.916
Romania	Romanians	0.905
Mali	Mande, Peul & Voltaic	0.900
Turkmenistan	Turkmen	0.894
Uzbekistan	Uzbeks	0.860
Philippines	Christian Lowlanders	0.859
Georgia	Georgians	0.825

Note: This table lists the name of the majoritarian ethnic group and its relative demographic size from the Ethnic Power Relations database (Vogt et al., 2015), for the countries where $\frac{\partial Y_{ss}}{\partial \gamma} > 0$ for $\alpha = 0.3, 0.5$ and 0.7

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