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

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April 18, 2016

Abstract

I construct a growth model with an appropriative contest and a common-pool investment game between politically organized rival ethnic factions. I determine how the long run coalition equilibrium shape incentives to invest. I show the existence of a unique steady state and investigate how the ease to capture rents affects economic performance. Using numerical simulations concerning resource-rich Middle Eastern and North African countries, I show that contest intensity can sometimes be beneficial eventually in spite of wasteful grabbing behaviours, thanks to a mechanism related to the concentration of power. When rents become easier to capture, dominant groups have an incentive to further expand their influence share. This can be beneficial as these are the groups that contribute the most to capital accumulation.

JEL Classification: E21, O43, P48.
Keywords : Economic performance, appropriative competition, ethnic.

*I thank David de la Croix for his help, advice and suggestions. I also thank Raouf Boucekkine, Frederic Docquier, Frederic Gaspart, Nippe Lagerlof, Hel'ene Latzer, Fabio Mariani, Petros Sekeris and Chrysovalantis Vasilakis for their comments on earlier versions of this paper.

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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 is particularly relevant in oil-rich countries in the Middle East and North Africa (MENA) that 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 there is an ongoing debate in the economic resource curse literature on the consequences of oil endowments in terms of income in the long run. Some recent contributions (Brunnschweiler and Bulte, 2008; Alexeev and Conrad, 2009; Smith, 2015) find a positive linkage between natural resources and development thus discrediting the seminal finding of Sachs and Warner (1995).[1]

In this paper, I corroborate these recent findings by exposing a theoretical mechanism on the potentially favourable effect of oil on investment and capital accumulation. 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 political efforts exerted determine the proportion of de facto power of each clan that subsequently sets the fraction of a common output available for their respective consumption. I use the concepts of influence and de facto power. Here, de facto power is used to attract resources through patronage and clientelism. De facto power is defined in opposition to de jure power and is what happens in practice or actuality, but not officially established.[2] I characterize the equilibrium of this model and demonstrate its uniqueness. I then show that the steady state of the model exists and is unique.

[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 threat of coup is a reason why politicians rely on patronage by providing a cut of the rents to opposing factions so that the incentive of an attempt diminishes (Collier, 2010b; Francois et al., 2015). In Besley and Persson (2010), patronage is modelled 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. (2003) where the ruler avoids challenges thanks to a threat of punishment and reward. La Porta et al. (1999) mentions that there is costly rent-seeking and conflict over the provision of public goods when dominant clans use their supremacy to appropriate economic benefits.

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 what is left for the others. Because the groups contributing to investment are the most influential ones, an increase in appropriative competition intensity could reduce these negative externalities by further expanding the influence of these groups which in turn, may spur investment in some cases.

To assess the importance of this mechanism, I calibrate the steady state for a sample of fourteen natural resource-rich MENA countries using data on real GDP per capita and investment from the Penn World Tables version 7.1 (Heston et al., 2012) and on 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 rent-seeking obstacle. This result is important in light of the Lipset modernization hypothesis that affirms that societies that become richer tend to democratize. A less democratic and centralized regime could in some cases be better suited to temporarily coerce society into productive investments with long term prospects at the expense of short-sighted consumption ultimately leading to a democratic transition beneficial to all strands of the population (Rao, 1984; Besley and Kudamatsu, 2007; Amegashie, 2008).

This paper is related 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, 2011; Robinson et al., 2006; Matsen et al., 2016; Caselli and Tesei, 2011; Anyanwu and Erhijakpor, 2013). These models study the negative repercussions in situations where adversaries compete for a price or a common asset by engaging in unproductive appropriative behaviours. The contest success function is a modelling tool frequently used there where the effort of a side increases its probability to win the price. Here, I take the stance to investigate a conflict between politically organized ethnic groups. A priori, the factions competing for resources could be any type of social or political entity.[4] Because of

[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) or Iqbal and Daly (2014).

[4] The reasons to focus on ethnicities come from the theory of ethnic conflicts developed following the seminal

that, a particular aspect 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 important assumption stems from the logic of coalition formation in weak states and the concept of neopatrimonialism.[5] In the case of MENA countries, political divisions tend to follow religious cleavages, a fact well reflected in the EPR data used here.

The literature on ethnic diversity and conflict incidence (Collier and Hoeffler, 2004; Fearon and Laitin, 2003; Cederman et al., 2009) underpins the modelling choices of this paper. In particular, some recent studies have demonstrated that natural resources cause conflicts at the local level (Berman et al., 2015; Caselli et al., 2015; Morelli and Rohner, 2015). 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 important pipelines to secure the revenues accruing from them.

Incidentally, this paper is related to the institutional approach to economic development which is concerned with the fundamental causes of growth.[6] Many authors point to the fact that insecure property rights reduce prosperity through a negative effect on private investment (Rao, 1984; Acemoglu and Robinson, 2010; Besley and Ghatak, 2010). By looking at the evolution of de facto power and investment, it speaks also to the topic of political transitions and their economic implications (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^i_t at time t. These

contribution of Horowitz (1985) that 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 is related 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 to the shared language in fuelling ethnic oppositions while Fearon (1999) and Caselli and Coleman (2013) refer to the exlusivist nature of ethnic categories as a notable factor. Esteban and Ray (2007, 2008) and Francois et al. (2015) describe the possibility that within-group inequalities result in the salience of ethnicities that are made of rich and poor individuals that are able to contribute funds and labour to the technology of conflict.

[5] Neopatrimonialism also called clientelism or patronage is system of social hierarchy where patrons use state resources in order 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); North et al. (2009); Acemoglu and Robinson (2005, 2012); Besley and Persson (2010); Baland et al. (2010); Collier (2010b)

relative shares sum to one i.e. $\sum_{i \in \mathcal{N}} n^i = 1$ and $\sum_{i \in \mathcal{N}} P^i_t = 1$ at all times. The stock of capital at time t is denoted K_t and enters as an input into the production process of the economy, that is represented by a standard Cobb-Douglas function with capital and labour

$$Y_{t+1} = AK_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

where A is the total factor productivity coefficient and the parameter α, $0 < \alpha < 1$ is capital elasticity, as usual. Production takes time and the output created at t is delivered at time $t + 1$. L_t denotes labour input at time t, defined more precisely below. The preferences of the groups are represented by the utility function

$$U^i_t(\mathbb{C}_t, \mathbb{E}_t) = \log(C^i_t) + \beta \log(P^i_{t+1} Y_{t+1}) \tag{2}$$

where the parameter β, $\beta > 0$, is the discount factor and $P^i_{t+1} Y_{t+1}$ is the slice of output transmitted to group i at $t + 1$.[7] $\mathbb{C}_t$ is the $N \times 1$ vector of consumption strategies with typical element C^i_t, the consumption of group i. $\mathbb{E}_t$ is the $N \times 1$ vector of political effort strategies, with typical element E^i_t, the political effort of group i. I define this variable to be 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, D. and Michel, P., 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 intervenes in the preferences. However, this possibility must be rejected here because the absence of property rights implies that there is no way 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 respective influence share and future production.

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

[8] Lagerlof (2012) 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 no-insurgency constraint. Bellettini and Ceroni (1997) study transaction costs and Weikard (1997) an intergenerational distributive conflict. Finally, Dincer and Ellis (2005) consider predation activities.

Another trump of this method is to allow the deduction of closed-form solutions to games with dynamic aspects and many players, unlike other possibilities that are often limited to two players settings because of technical difficulties. This is quite valuable to appropriately represent ethnic politics in this sample characterized by an abundance of divisions. While on the subject, an alternative modelling strategy with infinitely-lived representative agents would give exactly the same results. The only change would be the interpretation of the utility function.[9]

The strategies $\mathbb{C}_t$ and $\mathbb{E}_t$ are subject to the following constraints. In order 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 influence is needed to appropriate resources. Influence or power can be interpreted by any position or office that confers the possibility to its holder to affect how the gains are redistributed. 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 also key positions in governmental or private organizations. The ethnic groups compete for these positions 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 my 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, which is equal to the proportion of politically inactive people.

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

[9] Sugden argues that preferences of individuals change over time and that their present and future interests sometimes diverge. This is why equation (2) is a sensible representation of the preferences of competing ethnic groups. If Sugden's theory demonstrates a least a bit of validity at the individual level, it can be accepted with even more confidence for ethnic groups composed of many individual with uncertain life expectancies, in this context where the future state depends on an equilibrium among many participants (Sudgen, 1998; Sugden, 2007).

The trade-off between appropriative and productive activities appears in equation (5). A group that contributes to the common labour supply by lowering its political effort sees its influence share decrease at the expense of the other groups.[10] Formally, this assumption imposes a strong separation between productive labour and political activism. Yet it does not necessarily require that people engage in only one activity 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. In consequence, relaxing this assumption would not alter the results.

It could potentially be attractive to consider a third trade-off, between leisure and the other activities. I prefer not to venture in this avenue because the interesting new aspects that this extension could bring to the analysis would certainly be at the cost of the closed-form solutions that I manage to attain here. This would unfortunately obscure the message of this paper a lot as an entirely numerical approach would be necessary, complexifying the detection of causal mechanisms. In addition, in MENA countries, a large proportion of the youth is unemployed making the interpretation of (4) strictly in terms of time available for labour or leisure less relevant than in advanced economies. By simply adopting a broader interpretation in terms of capabilities where leisure is not binding, 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 stock of capital 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) summarizes the second 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.

The law of motion of power is

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

[10]See equation (7) below.

The parameter γ, $0 < \gamma < 1$, captures the intensity of the appropriative competition. An interpretation of this parameter is the degree of resource dependence of the economy. It is a well-known fact that natural resources create rents that are easy to capture by the state and other interest groups (Collier and Hoeffler, 2004; Tsui, 2011). Here, the marginal effect of the political effort on the change in influence share is proportional to this parameter. This is the reason why 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 efforts are required to control an equivalent fraction of national income, because these revenues are easier to seize than the average. The patronage system is also stronger at all tiers of society making lobbying efforts more efficient in the appropriation of the rents. It could also mean that institutions protecting property rights and judicial system norms are weaker and thus fail to dissuade corruptive practices.

The idea behind this equation is that agent i exerts his 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 conceptualize power as a continuous variable because all important positions in state and private organizations confer authority, not only seats in the government cabinet. This assumption conveys thus well the idea that efforts and carried out to gain access to these positions. A group with a small influence has very 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. At the opposite, 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 as long as there are not too many tactical interactions between the positions which is likely to be true in this macroeconomic environment.

Finally, I make the following assumption on the parameter values. This assumption 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 $1 - \alpha$ for that.

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 maximizes 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 maximization problem. By rewriting the utility function and by using the complementary slackness conditions, I obtain the best response functions

$$C_t^{i,BR}(\mathbb{C}_t^{-i}) = \min\left(\max\left(0, \frac{P_t^i Y_t - \sum_{j\in\mathcal{N}\setminus\{i\}} C_t^j}{1+\beta\alpha}\right), P_t^i Y_t\right) \tag{9}$$

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

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 lower bounds of the strategy spaces are zero and the upper bounds are defined by the constraints (3) and (4). The interior solutions are linear in the sum of strategies of the other players.

The following proposition claims that a unique equilibrium of this model exists at all periods and characterizes 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*

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

(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 characterization is obtained by generalizing the solution of the first-order conditions system.

Equation (11) encompasses the basic 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. The consumption of the more influential groups ($i \in \mathcal{S}$) is strategically determined and the same for all these groups. S is the number of groups participating in this strategic interaction which pushes up the strength of the negative externality slowing investment down. Indeed, if we posit that $\mathcal{S} = \mathcal{N}$, the consumption of each group would be equal to $\frac{Y_t}{N+\alpha\beta}$ and investment to $\frac{Y_t\alpha\beta}{N+\alpha\beta}$. The larger N is, the smaller investment would be. This is a classical result in investment games. Here, when we relax the assumption that $\mathcal{S} = \mathcal{N}$, the same happens even if a fraction of output is already captured by the groups not in $\mathcal{S}$.

It is also interesting to ask what happens when the total influence of the groups in $\mathcal{S}$ increases at the expense of the other groups proportionally without an induced change in the equilibrium partition. It is elementary from the solution (11) that this leads to an increase in investment because the consumption shares of the groups that invest remain unchanged while their disposable income is greater and because the remaining groups continue to consume their total disposable income that goes down.

Equation (12) expresses the equilibrium effort strategies. The most powerful groups tend to make no effort because they do not have much influence to gain compared to the loss in output produced ($i \in \mathcal{N} \setminus \mathcal{O} \setminus \mathcal{M}$). The most underrepresented groups do not offer labour and have a constrained political effort ($i \in \mathcal{O}$). From (7), their effort is very effective because they have much influence to gain. Some groups have an interior equilibrium effort ($i \in \mathcal{M}$)

[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.

that depends on $\sum_{j \in \mathcal{O}} n^j$, the sum of the demographic shares of the groups engaging fully in the contest, on their own influence share and on the sum of the influence shares of the groups with an interior solution $\sum_{j \in \mathcal{M}} P_t^j$.

It is not possible to directly infer the sign of the variation in effort equilibrium strategies due to a change in the value of γ from equation (12). Still, by inspecting equation (10), where γ increases the intercept without changing the slope of the interior linear best response effort, it is certain that the total effort is positively linked to this parameter. This is confirmed by the numerical simulations of subsection 3.2.

An implication of this model is that underrepresented groups tend to be more active politically. It is not easy to find empirical evidence illustrating this consequence because the phenomenon is mostly unobserved. It is notwithstanding at least bolstered by anecdotal evidence at both ends of the spectrum. Acemoglu's canonical example of 18th century Barbados (Acemoglu and Robinson, 2012), a society dominated by large landowners exploiting sugar plantations and slave labour illustrate the idea that this totally dominant elite did not need to devote efforts to further increase its influence. Its objective was to conserve the status quo and to maximize the output of their land. At the other extreme, the immolation of the poor street-vendor Mohammed Bouazizi, the event that is considered as the spark that ignited the Arab Spring revolution, witnesses that disenfranchised individuals that have no prospects at all are capable of almost anything.

To elaborate on this idea, I produce a small empirical inquiry using the Reputation of Terror Groups dataset from Tokdemir and Akcinaroglu (2016).[12] 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 organization i.e. categories of the number of active members. This table indicates that organizations that have an ethno-nationalist motive in the MENA sample tend to be more politically active and larger. This speculation is upheld by the estimation results of Probit and Ordered Probit models in Table II. These equations, estimated with standard maximum likelihood methods, have country controls and fixed-effects and the standard errors are robust. The coefficient of the variable 'Ethno-Nationalist Motive' is positive and significant in estimations (1) to (3) pinpointing that the size and political activism of this kind of organizations are more important.

[12] See Tables I and II.

2.2 Steady State

If the partitioning sets $\mathcal{S}$, $\mathcal{M}$ and $\mathcal{O}$ were know, Proposition 1 would completely describe the equilibrium in closed-form. In practice however, these sets are not known a priori. It is however always possible to 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 can be computed according to the laws of motions (6) and (7). 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

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

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

and

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

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

The proof of this proposition is in Appendix C. Similarly to 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 somewhat 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 Ω make an interior political effort and their steady state influence share is equal to the rapport of their political effort to the total effort. Steady states efforts and influence shares are the same across all these unconstrained groups.

Because influence shares and labour strategies are uniquely defined at the steady state, the investment rate, symbolized here by the Greek letter *iota* is also unique at this stage. In consequence of that, the capital accumulation dynamics defined by (6) leads to a unique steady state characterized by a level of output Y_{ss}. This is formalized in Proposition 3.

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

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

where ι_{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 discussions above have highlighted that an increase in appropriative competition intensity γ tend to have a negative effect of on L_{ss} and a positive effect on ι_{ss}. How these two effects balance in total is not a priori determined. In the next section, I show by the way of a counter-example that it is not necessarily true that γ affects Y_{ss} negatively, even if this is the most likely outcome.

3 Numerical Analysis

Numerical simulations are required to study the impact of γ, the parameter capturing the intensity of the appropriative contest, on steady state output because of the various non-linearities between this parameter, the steady state efforts and influence shares. I explain in subsection 3.1 how I proceed to obtain calibrated values of the model parameters for 14 countries of the Middle East and North Africa region 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 I obtain parameter values that best associate model outcomes with their data counterparts. I use a sample of 14 ethnically divided countries from the Middle East and North Africa region for which information is available in the Ethnic Power Relations database (Vogt et al., 2015). I take the n^i's, the ethnic 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 to calculate 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 do not restrict the parameter space of α to a small neighbourhood around 0.3, the value generally admitted for this parameter because my model differs in many aspects from more traditional models and because the present context is different on many levels. I prefer to remain agnostic concerning this and to investigate with values everywhere in the [0,1] interval.

I set the parameter γ at the starting value $\gamma_0 = 0.85$, before changing it later. Thanks to this value, I can easily change γ without reaching the thresholds at 1 and at $1 - \alpha$ so that the assumptions of the model are respected.

Using the Penn World Tables version 7.1 (Heston et al., 2012) I construct a proxy for the steady state investment as a share of GDP by taking the average of this series over all years for each country. To concord with the model as best as possible, I reconstruct GDP as the sum of consumption and investment. I set the value of β for each country in order to match the calculated values with their data counterparts.

The steady state GDP proxy is constructed similarly with long run means of the real GDP per capita series, again reconstructed as the sum of consumption and investment, and the value of A, total factor productivity, for each country in the sample is set so that the simulated model concurs with this proxy. I thus obtain A_c and β_c for each country and each value of α.

Table I reports the results of this procedure. β represents the discount factor of the model of this paper. Even if this coefficient is usually less than one in macroeconomic models, this does not need to be the case here because it is the coefficient in the utility function (2) of 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 must be put in relation with the assumptions on population, which is normalized 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 rather than a result per se.

3.2 Comparative Statics

In this subsection, I report numerical simulations assessing the comparative effect of the parameter capturing the intensity of the appropriative competition, γ on steady state GDP. I consider small changes of γ in order to comply with 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 change 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 are for $\alpha = 0.3$, the dark dashed lines are for $\alpha = 0.5$ and the solid lines are for $\alpha = 0.7$.

γ affects Y_{ss} through two different channels. The first one 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 as well that operates though the steady state power configuration, $\mathbb{P}_{ss}$ and the resulting steady state investment share in GDP, ι_{ss}, that sometimes has a positive effect.[13]

The results shown in Figure I confirm that the first effect indeed tend to dominate. However, the second effect can theoretically outweigh the first one as demonstrated by the cases of Libya and Syria with $\alpha = 0.7$ and of Egypt with $\alpha = 0.5$ and $\alpha = 0.7$ in panels (3), (6) and (7). One of the reasons why this particular phenomenon is observed for larger values of α is because this makes the slope of ι_{ss} steeper and the slope of L_{ss} flatter in the Y_{ss} relation i.e. equation (14). A larger value of α thus magnifies the positive effect if there is any and reduces the negative effect. It is interesting to notice that Libya, Syria and Egypt are countries characterized by rather large ethnic majorities as shown in Table IV and this is a condition necessary to observe this particular positive effect because it is conducted through the investment of those dominant groups.

4 Conclusion

The countries of the Middle East and North Africa region have at their disposal an unequalled abundance of wealth originating from their natural resource endowments. Whether

[13] This effect could be absent if all groups have a loose consumption constraint (3).

this has been good or bad in economic terms is not certain and the debate on the resource curse is still open. Meanwhile, their political regimes are often less open than in OECD countries and their populations are rarely homogeneous but rather composed of competing factions. The general message of international development agencies like the World Bank or the International Monetary Fund is to promote democracy, but it is unclear whether this will have a favourable impact on the economy in all circumstances.

To provide answers to this type of questioning, I construct a macroeconomic growth model with an appropriative contest between politically organized ethnic factions. My modelling strategy is inspired by a voluminous literature on ethnic politics and clientelism. These issues have been shown to be relevant for the countries under consideration. I characterize the equilibrium in terms of consumption and political effort strategies and demonstrate its uniqueness. I then show that there is a unique steady state, described by the political influence configuration of the groups and the limiting level of output.

In particular, I look in detail at the role played by the appropriative competition intensity. The spontaneous hunch about the economic consequences of an increase of this parameter is that it is detrimental. Concerning this nonetheless, I establish theoretically that this is not always true by uncovering a mechanism operating through the steady state power configuration and the investment rate. Essentially, when competition intensity increases, the dominant groups have an incentive to expand their influence. The minority groups for their part are unable to respond profitably to this change because they were already at the corner in their political strategy space. Because the dominant groups are those that contribute the most to the common investment, the result is a boosted rate of capital accumulation.

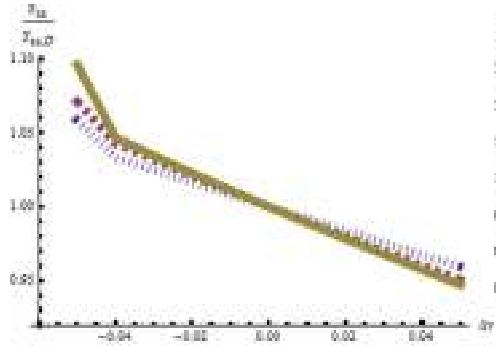
Using a calibrated model for 14 MENA countries, I show by the way of a numerical counter-example that this positive effect could conceivably prevail over the negative one caused by appropriation. My results indicate that this would be the case in countries with large ethnic majorities like Libya, Syria or Egypt if the capital elasticity coefficient is sufficiently large.

In connection with the Lipset modernization hypothesis, a broad implication of this result is that these countries could be better-off in the long run with a strong central state that efficiently redistributes oil rents to the population in the form of education spending and infrastructure. Democratization prospects would be better in this respect than an unorganized and counter-productive scramble for rents. Eventually, a peaceful democratic transition would be more likely in these countries once they have hoarded sufficient capabilities to support the necessary institutions of a well-functioning open state able to guarantee a fair and efficient repartition of the nation's wealth.

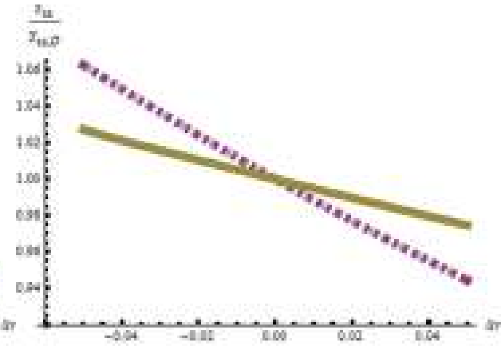
Finally, this research could be extended in various directions by integrating asymmetries in the analysis. It could be possible for instance to assess the welfare consequences for the minorities of efficiency gains in the technology of conflict that benefit the majority disproportionately.

Figure I: ***Sensitivity analysis:***

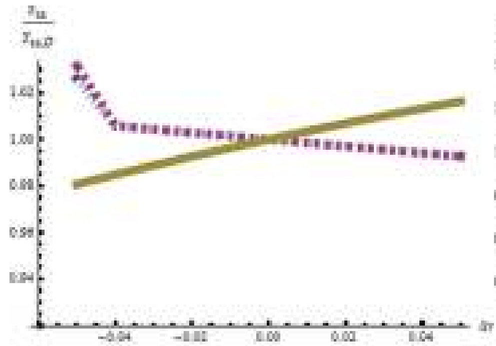
(1) ***Morocco***



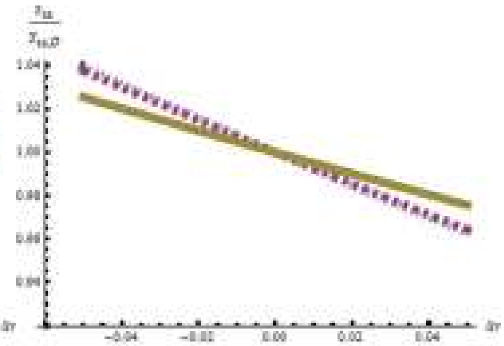
(2) ***Algeria***



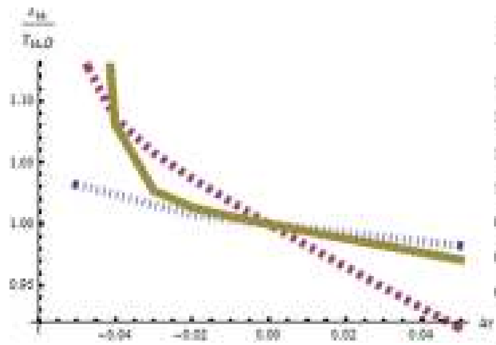
(3) ***Libya***



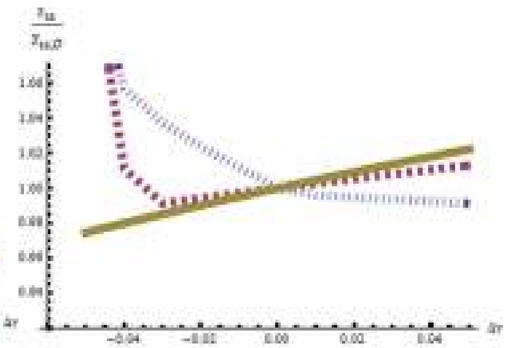
(4) ***Iran***



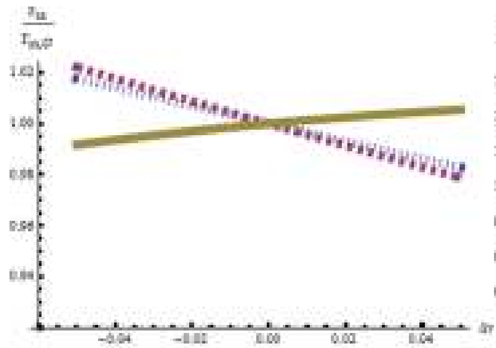
(5) ***Iraq***



(6) ***Egypt***



(7) ***Syria***



(8) ***Lebanon***

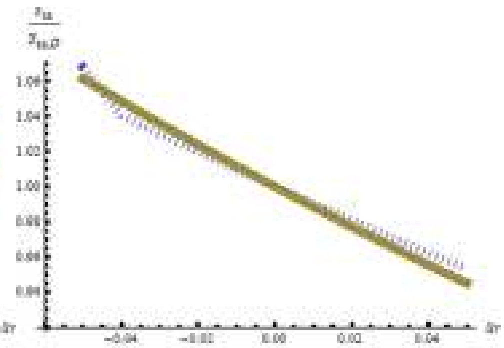
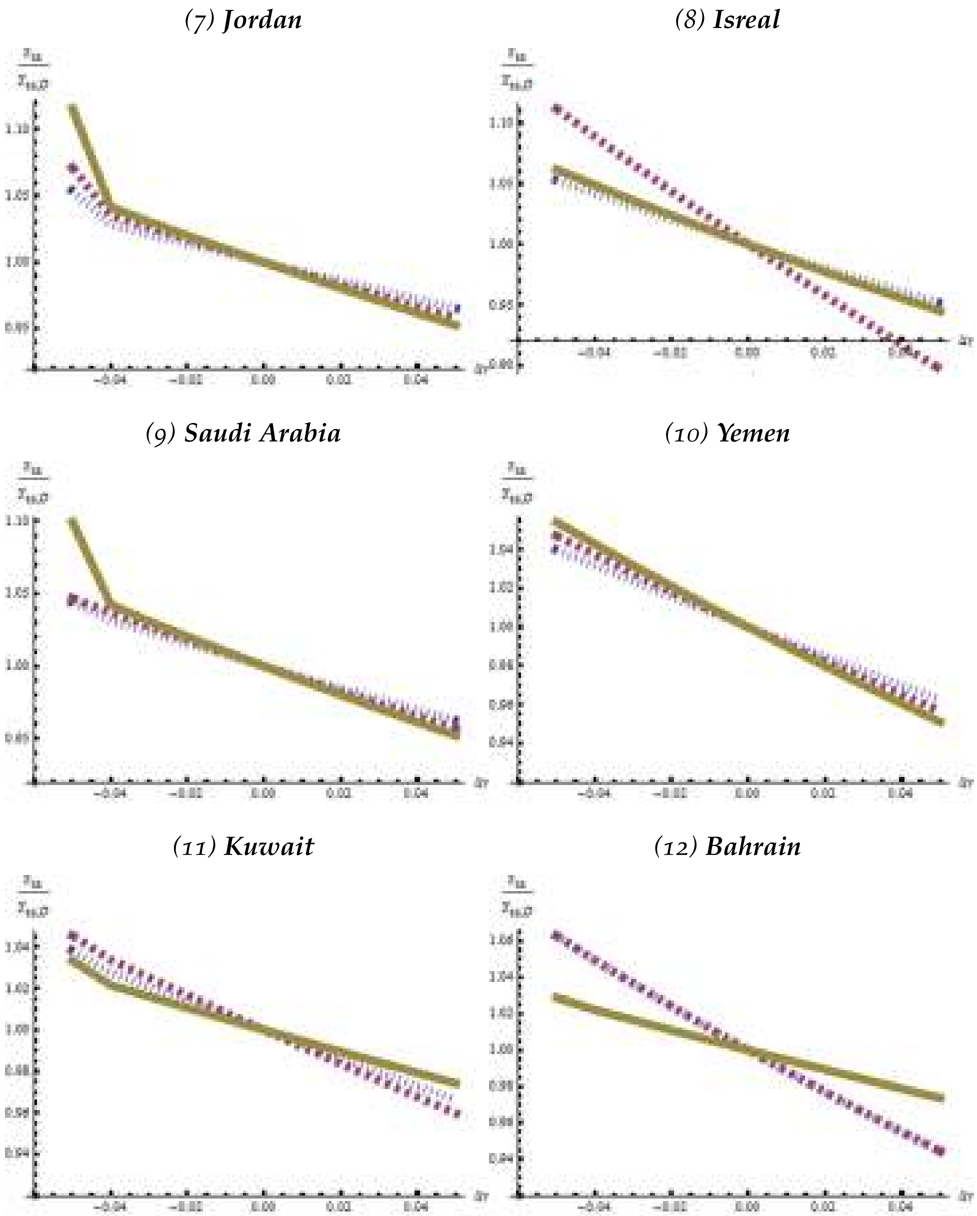


Figure I: ***(continued)***



Effect of changes in competition intensity γ on steady state income. The grey dashed lines are for $\alpha = 0.3$, the dark dashed lines are for $\alpha = 0.5$ and the solid lines are for $\alpha = 0.7$. Each panel for a country 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.

5 Appendix

A : First Order Conditions

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

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

A vector $(\mathbb{C}_t, \mathbb{E}_t)$ is a pure strategy temporary equilibrium of the model at time t whenever each group maximizes 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 maximization 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

$$\begin{aligned}
\frac{\partial \mathcal{L}}{\partial C_t^i} &= 0 & (17)\\
\frac{\partial \mathcal{L}}{\partial E_t^i} &= 0 & (18)\\
0 \leqslant C_t^i &\leqslant P_t^i Y_t & (19)\\
0 \leqslant E_t^i &\leqslant n^i & (20)\\
\mu_k^i &\geqslant 0 \quad \text{for } k = 1,2,3,4 & (21)\\
\mu_1^i C_t^i = \mu_2^i (C_t^i - P_t^i Y_t) &= \mu_3^i E_t^i = \mu_4^i (E_t^i - n^i) = 0 & (22)
\end{aligned}$$

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

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

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

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

B : Proof of Proposition 1

(i) Let's 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 thus the existence of an equilibrium.

(ii) To demonstrate uniqueness, I use the fact 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

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

where

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

and

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

$x^i = C^i_t$ and $z^i_t = E^i_t$ are the own strategies and $X = \sum_{j\in\mathcal{N}} C^j_t$ and $Z = \sum_{j\in\mathcal{N}} E^j_t$ 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.

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

(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) Let's define the mapping

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

Δ^{N-1} is the unit simplex of dimension N-1, $\{(P^1,\dots,P^N) \mid \sum_{i\in\mathcal{N}} P^i = 1 \text{ and } P^i \geqslant 0 \text{ for all } i\}$. $\mathbb{E}_t(\mathbb{P}_t)$ 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 $E^i_{ss} > 0\ \forall i$. If $E^j_{ss} = 0$ for some j then $E^i_{ss} = 0\ \forall i$ otherwise $P^j_{t+1} < P^j_t$ and this is not a steady state. $E^i_{ss} = 0\ \forall i$ is impossible because the intercept of the best-response function (24) is strictly positive for at least some i.

$\frac{\gamma-(1-\alpha+\gamma)P^i_t}{\gamma(1-P^i_t)(2-\alpha)} > 0$ is equivalent to $P^i_t < \frac{1}{1+\frac{1-\alpha}{\gamma}}$ 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^i_{ss} 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 $E^i_{ss} = \bar{E}_{ss}$ and $P^i_{ss} = \bar{P}_{ss}$ 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.

Let's say that 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

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

We thus have that $E^k_{ss} < E^l_{ss}$.

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

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

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 Organizations by Ethno-Nationalist Purpose***

			Ethno-Nationalist			
	All		No		Yes	
Politics	Freq.	Percent	Freq.	Percent	Freq.	Percent
0	129	25.00	89	33.21	40	16.13
1	387	75.00	179	66.79	208	83.87
Size Category	Freq.	Percent	Freq.	Percent	Freq.	Percent
1	44	8.53	19	7.09	25	10.08
2	217	42.05	129	48.13	88	35.48
3	170	32.95	106	39.55	64	25.81
4	85	16.47	14	5.22	71	28.63
Total	516	100.00	268	100.00	248	100.00

notes : Frequency table for the 516 organizations from Middle East and North Africa from Tokdemir and Akcinaroglu (2016). 'Ethno-Nationalist' indicates whether the organization has an ethno-nationalist objective. 1 means 'yes'. There are four size categories 1 to 4 defined by thresholds, see Tokdemir and Akcinaroglu (2016) for the details. The time period covers 32 years between 1980 and 2011.

Table II: ***Probit and Ordered Probit Estimates : Effect on Polical Activism and Size of Ethno-Nationalist Motive.***

	Dependant Variable		
	Politics		Size
	(1)	(2)	(3)
	Probit	Probit	Ordered-Probit
Ethno-Nationalist	0.62	0.89	0.63
	(4.71)**	(4.85)**	(4.83)**
Year-FE	Yes	Yes	Yes
Country-Controls	No	Yes	FE
N	505	358	516

notes : Columns (1) and (2) present estimates of a probit model where the dependent variable is political participation. No controls in (1) and controls for GDP, Polity from Marshall and Jaggers (2007) and population in (2). Column (3) displays the estimates of an ordered probit model on the size category of the organization. Column (3) has country fixed-effects. All equations have year fixed-effects. All estimated standard errors are robust. t-ratio's in parentheses.

Table III: ***Calibrated Parameters***

	Total factor productivity A and discount factor β					
	$\alpha = 0.3$		$\alpha = 0.5$		$\alpha = 0.7$	
	A	β	A	β	A	β
Morocco	204.61	3.02	98.36	1.74	9.78	1.23
Algeria	300.32	6.27	105.40	3.75	11.53	2.68
Libya	526.02	3.16	115.07	1.81	14.66	1.01
Iran	375.03	2.57	72.49	6.06	12.68	3.90
Iraq	322.29	1.68	75.56	1.39	9.69	2.17
Egypt	430.30	1.01	134.35	0.59	9.97	0.34
Syria	316.28	0.73	72.84	0.44	10.38	0.84
Lebanon	733.65	1.43	110.99	0.86	16.23	0.61
Jordan	625.06	2.99	146.21	1.68	12.60	1.14
Israel	1095.63	1.32	161.44	0.79	17.47	0.57
Saudi Arabia	858.14	2.48	132.49	1.49	20.55	3.36
Yemen	333.71	1.13	77.51	0.68	17.48	0.49
Kuwait	1756.26	5.58	277.90	3.07	42.18	2.07
Bahrain	1363.11	5.64	249.61	3.38	41.20	2.42

notes : 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 14 countries of the MENA sample for $\alpha = 0.3, 0.5, 0.7$. Data source : the Penn World Tables (Heston et al., 2012). GDP is reconstructed as the sum of consumption and investment.

Table IV: ***Majoritarian Ethnic Groups in the Sample of MENA Countries***

Country	Group Name	Relative Size
Egypt	Arab Muslims	0.91
Libya	Arabs	0.84
Algeria	Arabs	0.72
Bahrain	Shi'a Arabs	0.70
Syria	Sunni Arabs	0.66
Iraq	Shi'a Arabs	0.64
Kuwait	Kuwaiti Sunni (Arab)	0.62
Morocco	Arabs	0.59
Iran	Persians	0.55
Jordan	Palestinian Arabs	0.52

notes : Majoritarian groups with name and relative size in the population in the MENA sample. Data source : the Ethnic Power Relations database (Vogt et al., 2015).

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