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THE NEXUS BETWEEN INCLUSIVE INSTITUTIONS AND INCLUSIVE GROWTH: A Game Theoretic Analysis

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ABSTRACT

In recent times, the focus in growth literature has shifted from understanding how countries can achieve economic growth to understanding how they can attain sustainable inclusive growth. Hence, one contemporary interest is to understand why growth is not inclusive in a number of countries, including Nigeria. It is argued in this paper that inclusive growth can be achieved only if institutions (both political and economic) are inclusive. Using the tool of game theory, the paper shows how those who control political power (the political elite) use their power to set up exclusive institutions which put the society on an exclusive growth trajectory. The outcomes of the game show that exclusive institutions emerge and thus, exclusive growth when: (i) elite consumption depend largely on rent that comes mainly from natural resources (such as oil); (ii) elite consumption is a function of market profit; and (iii) the elite are afraid of political replacement. Once a society finds itself on a particular institutional path, there is a self-reinforcing feedback mechanism that persistently keeps the society in the vicious circle. However, the vicious circle of exclusiveness can be broken if: (a) there is broad base coalition among citizens; (b) there is significant increase in citizen de jure power; or ©it becomes difficult for the elite to solve their collective problems; and (d) the elite are incentivized to choose inclusive institutions.

JEL classification: C70, D72, P16

1. Introduction

THE FOCUS in growth research is shifting away from understanding how countries can achieve mere rapid increase in income (economic growth) to how countries can achieve sustained inclusive growth. This shift is due to recent experiences around the world in which some countries, including Nigeria, recorded rapid income (GDP) growth with poverty situations remaining the same, or in some cases becoming worse. One of the fundamental issues in inclusive growth research is understanding why growth is not inclusive. In other words, why are so many people excluded from the growth process as well as from benefiting from growth? This paper attempts to provide an explanation to why growth is not inclusive, that is, exclusive. The key argument in the paper is that the nature of institutions determine whether growth would be inclusive or exclusive. Therefore, the paper aims to find out the linkage that exists between institutions and growth using the tools of game theory. More specifically, the paper attempts to (I) establish how exclusive (inclusive) institutions result in exclusive (inclusive) growth; and (ii) show why exclusive institutions exist and persist.

The paper is organized in seven sections. Section 1 is the introduction the basic concepts are contextualized in section 2. Section 3 presents the building framework of the game, while the assumptions of the game are presented in section 4. The outcomes of the game are presented in section 5; lessons for Nigeria are drawn in section 6, and finally, section 7 concludes the paper.

2. Contextualization of Concepts

Institutions and inclusive growth could mean different things to different people; hence, it is important to contextualize these concepts to avoid misconceptions. There is no general consensus on the definition of institutions as well as inclusive growth; however, some working definitions are adapted in this paper.

2.1 The concept of institutions

One of the most widely accepted definitions of institutions was given by North (1990). According to him, "institutions are the rules of the game; more formally, are the humanly devised constraints that structure political, economic and social

traditions, customs, norms of behaviour, conventions and self-imposed codes conduct) as well as their enforcement characteristics. In other words, they con: of the structure that humans impose on their dealings with each other. Institutic often establish the constraints, determine the costs and benefits under wh individuals take economic decisions. The extent of constraints and the choi individuals make in different institutional settings depend on the effectiveness their enforcement. Institutions are constitutive rules and practices prescrib appropriate behaviour for actors. They empower and constrain actors differer and make them more or less capable of acting according to prescribed rules appropriateness. The core perspective is that institutions create elements of or and predictability.

In this paper institutions are broadly divided into two: economic institutio and political institutions. However, the interactions between these two sets institutions is complex; on the one hand, political institutions shape the fate economic institutions and on the other, economic institutions are critical to the f of political institutions. Thus, it is difficult mapping a distinction between politi and economic institutions.

There are different approaches and ways of understanding political institutio According to March and Olsen (2006), the approaches differ by how individu understand:

i. the nature of institutions as the organized setting within which mod political actors must typically act;
ii. the processes that translate structures and rules into political impacts; a
iii. the processes that translate human behaviour into structures and rule: well as establish, sustain, transform or eliminate institutions.

March and Olsen (1989, 1995) conceptualize political institutions as:

> . . . relatively enduring collection of rules and organized practices, embedded in structures of meaning and resources that are relatively invariant in the face of turnover of individuals and relatively resilient to the idiosyncratic preferences and expectations of individuals and changing external circumstances.

justify and legitimize behavioural codes. In this way, political institutions are considered to organize the polity and have an ordering effect on how authority and power are constituted, exercised, legitimized, controlled and redistributed. They affect how political actors are enabled or constrained and the governing capabilities of a political system. Thus, premised on this preview and definition of institutions by North (1990), political institutions in this paper are seen as the "political rules of the game". They are the laws and regulations that govern the political process and political decision making (including the decision to provide public services such as infrastructure) as well as the citizens' ability to engage with and criticize that process.

Economic institutions can also be seen as the "economic rules of the game". They are the laws, policies and regulations that govern the interaction of agents in market transactions, including buying and selling of goods and services, and the use of property. They define the level of restriction on agents to engage in mutually agreed upon economic transactions. They shape the incentives of key economic actors in society, in particular, they influence investments in physical and human capital, technology, as well as the organization of production.

The main function of economic institutions is to minimize transaction costs. This was stressed by Coase (1937) that, if we move from a world of zero to positive transactional costs, what becomes immediately clear is the crucial importance of the legal system in the new world. As a result, the legal system will have a profound effect on the workings of the economic system and may in certain respects be said to control it. Hence, property rights law, rule of law, regulatory quality and types of credit arrangement are common examples of economic institutions. In between political and economic institutions are overlapping institutions such as independent judiciary, press freedom, civil liberties, voice and accountability, control of corruption, efficient bureaucracy, etc.

2.2 The concept of inclusive institutions

Economic institutions are said to be inclusive if such institutions allow and encourage participation by the great mass of people in economic activities that

health care, energy, transport and communication infrastructure) that provide a level playing field on which people can exchange and contract; they must also permit the entry of new businesses and provide economic opportunities, not just for the elite but for a broad cross-section of the society.

Inclusive political institutions will ensure that political power is not concentrated in the hands of a few individuals or a narrow group of people, rather political power is open to a broad set of people. This means that inclusive political institutions create a level playing political ground. Inclusive political institutions will also allow the citizens to hold politicians accountable, and will ensure that politicians do not use their political power to promote narrow interests. If political institutions are inclusive, the citizens will influence how political power can be used to the best interests of the majority, such as creating inclusive economic institutions and using national resources to provide infrastructure for the benefit of the generality of the people.

2.3 The concept of inclusive growth

Growth is said to be inclusive if it: (i) creates and expands economic opportunities, and (ii) ensures broader access to these opportunities so as to allow the majority, including the vulnerable, to participate in and benefit from growth (McKinley 2010). The African Development Bank (2012) defines inclusive growth as:

> . . . economic growth that results in wider access to sustainable socio-economic opportunities for a broader number of people, regions or countries while protecting the vulnerable, all being done in an environment of fairness, equal justice, and political plurality.

Inclusive growth is not only concerned with poverty reduction but also equitable distribution. Klasen (2010) describes inclusive growth as nondiscriminatory and disadvantage-reducing growth. He argued that disadvantaged groups, including members of ethnic minorities, people in remote rural locations, and women, have not benefited proportionately from the rapid economic growth experienced in Asia

investing in education, health, and basic social services as well as providing productive employment opportunities.

3. The Linkage between Institutions and Growth

The linkage between institutions (inclusive or exclusive) and growth (inclusive or exclusive) is summarized in a schematic chart presented in figure 1. The linkage as presented in the figure is developed from the ideas in the book, *Why Nations Fail* by Acemoglu and Robinson (2012). It was argued in the book that the distribution of power influences political institutions, while political institutions determine economic institutions, which in turn determine the prosperity or otherwise of the society.

There are two possible institutional trajectories that societies can choose for themselves, either the path of inclusive institutions or the path of exclusive institutions. Since those who control political power play a key role in choosing the institutional trajectory, when the distribution of political power is disproportionately concentrated in the hands of few individuals or a narrow group, then exclusive political institutions are most likely to emerge. Exclusive political institutions will lead to exclusive economic institutions, which then result in exclusive growth. However, when the distribution of political power is broad, inclusive political institutions would emerge, which further lead to inclusive economic institutions and inclusive growth.

By choosing exclusive political institutions, there will be little or no constraints to the exercise and abuse of power. Furthermore, exclusive political institutions would lead to exclusive economic institutions, which give few individuals/ narrow groups a monopoly on the control of economic activities in the society. Thus, the society ends up at exclusive growth equilibrium with huge inequalities in the distribution of wealth. This inequality will reinforce the uneven allocation of power which aggravates the exclusiveness of institutions and growth. Hence, the society is trapped in a vicious circle of exclusive institutions and exclusive growth.

However, when the distribution of political power is broad, broad-based political institutions which are inclusive would be chosen. Constraints on the exercise of political power is inherent in inclusive political institutions. Thus, inclusive political institutions will result in inclusive economic institutions, which

concentrated in the hands of a group of few individuals; hence, a small group cannot use its economic might to increase political power disproportionately, so as to enforce exclusive institutions. As a result, the society ends up in vicious circles of inclusive institutions and inclusive growth.

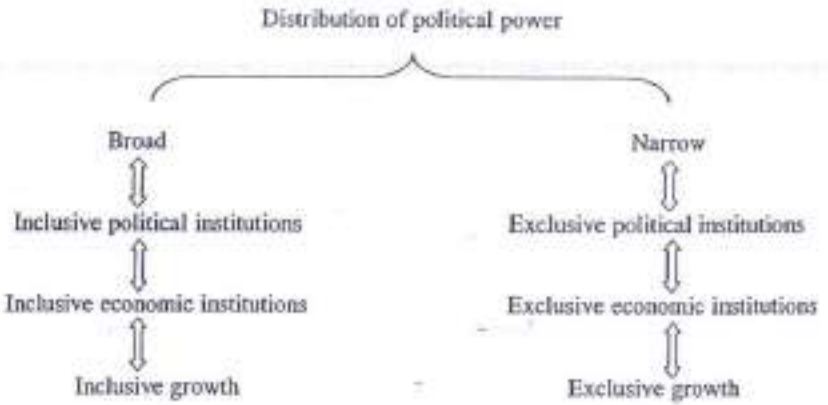

Figure 1. Institutions' trajectory

Summary: inclusive institutions create inclusive growth, while exclusive institutions lead to exclusive growth.

4. Nature of the Game

It is a sequential game first played by nature which divides the population into two: political elite and citizens. The third group, which are the entrepreneurs can emerge either from the elite or citizens, or both. Meanwhile, the game is a two-player game between the elite and entrepreneurs. The citizens are the workers and each worker owns one unit of labour which he/she supplies inelastically; thus, the choice of citizens in this game is irrelevant.

The elite control political power: they use their power to choose inclusive institutions (political and economic) or choose exclusive institutions. The entrepreneurs after observing the elite's choice would choose to invest if institutions are inclusive or choose not to invest if institutions are exclusive. Thus, the game consists of two players and four strategies.

The key question here is, what influences the choice of the elite? In other

importantly, why would the elite choose exclusive institutions since exclusive institutions will lead to sub-optimal equilibrium with widespread poverty. Acemoglu and Robinson (2008, 2012) argue that equilibrium institutions are determined by the distribution of political power, that is, the outcome of the interplay between *de jure* political power allocated by political institutions and investments in *de facto* political power. In this game, we attempt to show how/why those in control of political power would use their political power to set up exclusive or inclusive institutions.

4.1 Structure of the economy

Entrepreneurs have access to production technology for producing the final goods given as:

$$Y^h_{i(t)} = \frac{1}{\alpha} A_{(t)} I^j_{(t)} [(K^h_{i(t)})^{1-\alpha} (L^h_{i(t)})^{\alpha}] \quad (1)$$

where: $Y_{i(t)}$ is the final output produced by entrepreneur i who can be either an elite or a citizen; $K_{i(t)}$ is amount of capita; $L_{i(t)}$ is total amount of labour; $A_{(t)}$ is infrastructure; and $I^j_{(t)}$ represents institutions. Institutions can either be exclusive or inclusive, $j \in \{ex,\ in\}$.

If output Y is produced by elite entrepreneur $h = e$ and if produced by citizen entrepreneur $h = c$, hence, $h \in \{e,\ c\}$.

The objective of each entrepreneur is to maximize the current net profit written as:

$$\max_{K^h_{i(t)} L^h_{i(t)}} \frac{1 - \tau^h_{(t)}}{1 - \alpha} A_{(t)} I^j_{(t)} [(K^h_{i(t)})^{1-\alpha} (L^h_{i(t)})^{\alpha}] - w_{(t)} L^h_{i(t)} - K_{i(t+1)} \quad (2)$$

It is assumed that $\delta = 1$ for sake of simplicity, and capital is used up totally; τ is production tax. The FOC (First Ordered Condition) yields:

$$K^h_{i(t)} = ((1 - \tau^h_{(t)}) A_{(t)} I^j_{(t)})^{1/\alpha} \quad (3)$$

Equation (3) states that the decision to invest in capital is a negative function of tax rate, positive function of infrastructure and positive function of institutions. If institutions are exclusive, $I^{j=ex}_{(t)}$ only the few individuals who are favoured by the institutions will invest in capital; hence, growth becomes exclusive. On the other hand, if institutions are inclusive, $I^{j=in}_{(t)}$ and the majority of people would invest in capital and get involved in production of goods and services, then growth becomes inclusive.

There is the government sector, which is controlled by the political elite. Thus, government budget constraint is given as:

$$T^i_{(t)} + G^i_{(t)} + S_{(t)} + \tau_{(t)} \leq \int \tau^h_{i(t)} Y^h_{i(t)} dl + R; \quad (4)$$

where R is revenue from natural resources and/or foreign aid, $\tau^h_{i(t)} Y^h_{i(t)}$ is tax revenue; $T^i_{(t)}$ is transfer to each social group; $G^i_{(t)}$ is government expenditure on public goods; $S_{(t)}$ is part of total revenue used to maintain the state and $\tau_{(t)}$ is the political rent that goes to the political elite.

Meanwhile, the fundamental objective of all agents in the economy is to maximize utility function which is assumed to be risk neutral utility given as:

$$\sum_{t=0}^{\infty} \beta U(C_{i(t)}) \quad (5)$$

where β is the discount factor with which the agent discounts future utility, U is utility and C is consumption of goods and services.

The discounted consumption function of the elite is a function of net profit from production, transfer from government and political rent, while the consumption of the citizens is a function of net profit and labour income.

5. Equilibrium of the Game

The equilibrium of the game involves a sequence of policy variables

function. The equilibrium involves the political process, and the choice of political elite determines the equilibrium since they control political power. The outcome of the game depends on the incentives facing the elite, and these incentives vary according to economic and political situations. In this paper, four different situations / scenarios are considered: (I) when the elite are not involved in production; (ii) when the elite are the only producers; (iii) when the elite and citizens compete in the market place; and (iv) when the elite and citizens compete for political power.

In this game, the Markov Perfect Equilibrium (MPE) is considered to identify outcomes of the game. This allows us to focus on what happens at the equilibrium without necessarily looking at the entire history of the game.

5.1 Outcome when the elite are not involved in production

In this case, the discounted utility function of the elite depends on equation (4); the relative dominance of the two components on the right side of the equation determine the incentives of the elite. If $\tau_{i(t)}^{h=e} Y_{i(t)}^{h=e}$ is dominant, then the elite will choose inclusive institutions at time t so as to maximize tax revenue at time $t=1$. This outcome holds even if the elite do not value future tax revenue as long as entrepreneurs value future net profit. If the discount factor of investment β is sufficiently large, the behaviour along the equilibrium path would require each entrepreneur to make a voluntary contribution to raise funds that are paid to the elite so as to set inclusive institutions. This scenario best describes the Western world, where tax is the major source of government revenue and entrepreneurs are not politicians.

On the other hand, if R is dominant, tax revenue becomes less relevant; hence, there is no incentive to set inclusive institutions. The elite thus choose exclusive institutions in a resource-rich country with large political rent to go into the elite consumption function. This could explain why exclusive institutions exist in almost all the resource-rich countries in Africa. However, why do exclusive institutions exist in resource-scarce countries too?

Consider an economy where natural resources are scarce and the government budget is not sufficient to carry out the required investment in A. Alternatively, entrepreneurs decide to invest in technology and basic facilities to increase

$\Gamma(a)$, where Γ is non-negative, continuously differentiable and convex. The elite give certain incentives (such as tax holiday, ease of obtaining license, free or subsidized inputs like land, etc.), to the entrepreneurs. The entrepreneurs know the tax rate at time $t = 0$ but do not know the tax rate that will hold at future date ($t > 0$). The entrepreneurs sink investment after observing the policy variables $\{\tau, T, G, I^j, A\}$ at time $\tau = 0$. However, the elite will not be able to credibly commit to these policies particularly, except there are institutions that constrain them to do so or there is a credible threat from the producers. Since the elite will gain by deviating (particularly to higher taxes), they will therefore deliberately not allow inclusive institutions that impose constraints on the emergence of executive power. This has many implications. First, exclusive institutions that allow lack of commitment, and less constraint on the exercise of executive power will emerge. Second, the elite, though they would be willing to give additional property rights to new investors, the latter will not be willing to apply, hence property rights will be limited. Third, because of lack of commitment, investors are discouraged, therefore, growth becomes exclusive.

5.2 Outcome when the elite are the only producers

There are situations where the political elite control the major businesses in the economy, for example, King Hassan II of Morocco, who ruled between 1961 and 1999 became one of the largest businessmen in the country (Owen, 2004). In this case equation (2) becomes:

$$\max_{K_{i(t)}^{h=e} L_{i(t)}^{h=e}} \frac{1}{1-\alpha} A_{(t)} I_{(t)}^{j} [(K_{i(t)}^{h=e})^{1-\alpha} (L_{i(t)}^{h=e})^{\alpha}] - w_{(t)} L_{i(t)}^{h=e} - K_{i(t+1)} \quad (6)$$

The equilibrium of the game will involve asymmetric efficient institutions that exclude the citizens.

5.3 Outcome when the elite and citizens compete in the market place

Here, there are two set of entrepreneurs: the elite entrepreneurs and the citizen entrepreneurs. The elite consumption is described as:

$$C^{e}_{(t)} = \left[\frac{\alpha}{1-\alpha}\left((1-\tau^{e}_{(t)})a_{(t)}\right)^{1/\alpha} I^{j} - w_{(t)}\right]L^{e}_{(t)} + (r_{(t)} + T^{e}_{(t)}) \quad (7)$$

Equation (7) states that total consumption per elite is given by their profits plus the utility they benefit from government transfers and political rent. The idea here is that the elite want to get income from the market by increasing their profits while reducing their competitor's (citizen or entrepreneurs) profits, and at the same time enjoy rents from government revenues.[1] Hence, they set exclusive institutions that restrain citizens from competing in the market.

5.4 Outcome when the elite and citizens compete for political power

Suppose that there is a probability $\theta_{(t)}$ that in period t political power shifts from the elite to a representative citizen, the elite therefore, need to consolidate their political power so as to preserve it. Since the citizens are more numerous, they have more *de facto* power in a democratic era than the elite, only if they can jointly solve their collective problems. This, most often, degenerates to Arrow Impossibility Equilibrium. The elite are fewer in number, therefore, it is easy to collectively come together to jointly invest in their *de facto* power. Given that they also have more resources, they have more *de facto* power; hence, they are able to control *de jure* power.

The MPE will consist of exclusive institutions because the elite would use their political power to set exclusive institutions so as to limit the ability of citizens to take over government and policy making from them.

However, when the *de jure* power of citizens (such as votes of citizens counting) increase sufficiently, they can influence inclusive institutions. It is also possible for the elite's *de facto* power to decline particularly when it becomes impossible to solve their collective problems. Hence, citizens take over control of political power, then set up inclusive institutions.[2]

[1] See Appendix 1 for the change in the objective function.

[2] See Appendix 2 for the mathematical detail

5.5 Simple illustration of the nexus

Recent records have shown that agricultural output has grown significantly in Nigeria. However, the output of the majority of farmers who are in the rural areas remain low, and poverty among rural farmers is still high. So where is the growth in agriculture coming from? The growth in agricultural output recorded in the country could be as a result of the emergence of big farms owned by a very narrow group of farmers (the elite farmers), who are based in the urban areas. Hence, the growth in the agricultural sector is not inclusive, rather, it is exclusive because it comes from and benefits a narrow group instead of the majority. This exclusion is made possible because the institutions give exclusive opportunities to the elite farmers. These opportunities include:

i. the ability to acquire plots of land and obtain the property rights of the land, while the majority of rural farmers hold small pieces of inherited land without the legal or property rights of the land;
ii. the use of their property rights to access loans from financial institutions;
iii. the use of their resources to train or hire labour with the required education and skills for modern/mechanized farming; and
iv. the ability to purchase (import) the necessary machinery.

These differences are highlighted in table 1.

Table 1. Differences in Opportunities

Urban Elite Farmers	Rural Farmers
1. Large land holding (use political power to acquire)	Small land holding (usually family land/inherited land)
2. Secure property rights on land	Have only user rights, no property rights
3. Have access to financial resources	Limited or no access to financial resources
4. Access to modern machinery and skilled labour	Primitive system of farming with drudgery
• Farm output increases rapidly (growth)	• Farm output remains low (subsistence)
• Contribute to the growth of agriculture	• Do not contribute to growth
• Benefit from the growth of agriculture	• Does not benefit
• Included in the growth process	• Excluded in the growth process

Since the majority of farmers in the country belong to the category of excluded people, then the growth in agriculture is said to be exclusive due to the existence of exclusive institutions that open opportunities to only a narrow group of people.

Further examples of this nexus are evident in the study by Goldstein and Udry (2005), who have shown that in Ghana those who hold political office are responsible for land allocation, and by virtue of this have secure property rights on their own land, while the majority of citizens lack property rights (exclusive property rights). Bates (1981) also shows that policies in many sub-Saharan African (SSA) countries are urban biased.

6. Concluding Remarks

In the majority of developing countries (mainly in sub-Saharan Africa), political power is disproportionately concentrated in the hands of a narrow group of people (the political elite) and tax revenue is not a key variable in the elite utility function. This could explain why most of these countries are locked up in a vicious circle of exclusive institutions and growth.

However, there are a number of ways to break this vicious circle. First, if there is a broad-based coalition among the citizens, particularly in a democratic era, they can command *de jure* power that is sufficient to dislodge the *de facto* power of the elite, hence they influence the emergence of inclusive institutions which provide opportunities to the majority of the people in the society. If this is achieved, even on a small scale, there will be positive feedback that will make institutions and growth more and more inclusive. Second, if the benefits of controlling political power (political rent) decline significantly, there will be no incentive to want to hold on to power, hence, political institutions become inclusive, which will, in turn, lead to inclusive economic institutions and inclusive growth. Third, when it becomes difficult for the elite to solve their collective problems, their *de facto* power declines, thus, they lose control of *de jure* power, distribution of political power becomes more even and the society follows the path of inclusiveness. Fourth, the political elite can be incentivized (such as assuring them high future consumption) to choose inclusive institutions.

In conclusion, the reasons why societies end up on an exclusive institution trajectory vary according to the political and economic situation, and changing the trajectory would also depend on changing the same situation.

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Appendix I

The optimization problem in section 5.3 becomes:

$$\max_{\tau_{(t)}^{h=e}} \left[\frac{\alpha}{1-\alpha}(A_{(t)}^{I} L_{(t)}^{I})^{1/\varepsilon} - w_{(t)}\right] L_{(t)}^{h=e} + \frac{1}{\varepsilon}\left[\frac{\gamma}{1-\alpha}\tau_{(t)}^{h=e}((1-\tau_{(t)}^{h=e})A_{(t)}I_{(t)}^{I})^{1/\alpha} L_{(t)}^{h=e} + R\right]$$

and total labour demand is: $L_{(t)}^{h=e} + L_{(t)}^{h=c} = L$

$L_{(t)}^{h=c} = L$ *if* $((1-\tau_{(t)}^{h=c})AI^{I})^{1/\alpha} \geq (AI^{I})^{1/\alpha}$

The elite's problem is to choose in order to maximize:

$$\frac{1}{\varepsilon}\left[\frac{\gamma}{1-\alpha}\tau_{(t)}^{h=c}((1-\tau_{(t)}^{h=c})AI_{(t)}^{I})^{(1-\alpha)/\alpha} L_{(t)}^{h=c} + R\right] - \frac{\alpha}{1-\alpha}((1-\tau_{(t)}^{h=c})AI_{(t)}^{I})^{1/\alpha} L$$

Thus, the MPE features: exclusive institutions, high tax rate on citizens entrepreneurs, and exclusive infrastructure, hence, exclusive growth. The motive of the elite to reduce the prodactivity of their competitors in the market place results to exclusive equilibrium.

Appendix 2a. Political replacement via non-democratic means

Let probability of replacement be: $\theta_{(t)} = \theta(\lambda \varepsilon Y_{(t)}^{h=c}) \in [0, \quad 1)$

The dynamic maximization problem of the elite becomes:

$$V^{e}(E) = \max_{\tau_{(t)}^{h=e}}\left\{\frac{\alpha}{1-\alpha}(AI^{I})^{1/\alpha} L + \frac{1}{\varepsilon}\left[\frac{\gamma}{1-\alpha}\tau_{(t)}^{h=e}((1-\tau_{(t)}^{h=e})AI^{I})^{(1-\alpha)/\alpha} L + R\right] + \beta\left[V^{e}(E) - \theta\left(\frac{\alpha}{1-\alpha}((1-\tau_{(t)}^{h=c})\alpha)^{\frac{1-\alpha}{\alpha}} I^{I} L\right)(V^{e}(E) - V^{e}(C))\right]\right\}$$

The first order condition for an interior solution gives:

$$\frac{\gamma}{(1-\alpha)\varepsilon}((1-\tau_{(t)}^{h=e})AI^{I})^{(1-\alpha)/\alpha} L\left(1 - \frac{1-\alpha}{\alpha}\frac{\tau_{(t)}^{h=e}}{(1-\tau_{(t)}^{h=e})}AI^{I}\right) + \beta E\theta'\left(\frac{\alpha}{1-\alpha}((1-\tau_{(t)}^{h=c})AI^{I})^{1/\alpha} L\right)(V^{e}(E) - V^{e}(M)) = 0$$

Appendix 2b. Political replacement via democratic means

The value function for a representative elite is written recursively as:

$$V^{e}(D/\sigma_{(N)}, \sigma_{(D)}) = \max_{\sigma^{i} \geq 0} -\sigma^{i} + \left\{\rho(\sigma^{i}, \sigma_{(D)}^{e}/D)\left[\mathcal{R}_{(D)}^{e} + \beta V^{e}(N/\sigma_{(N)}^{e}, \sigma_{(D)}^{e})\right] + \left(1 - \rho(\sigma^{i}, \sigma_{(D)}^{e}, \sigma_{(D)}^{e}/D)\right)\left[\mathcal{R}_{(D)}^{e} + \beta V^{e}(D/\sigma_{(D)}^{e}, \sigma_{(D)}^{e})\right]\right\}$$

The First Order necessary Condition is:

$$\mu_{(D)}^{e} f\left[\mu_{(D)}^{e}\left((E-1)\sigma_{(D)}^{e} + \sigma^{i}\right) - \mu_{(D)}^{e} L\sigma_{(D)}^{e} - \eta\right][\Delta\mathcal{R} + \beta\Delta V^{e}] \leq 1$$

The Second Order sufficient Condition is given as:

$$f'\left[\mu_{(D)}^{e}\left((E-1)\sigma_{(D)}^{e} + \sigma^{i}\right) - \mu_{(D)}^{e} L\sigma_{(D)}^{e} - \eta\right] < 0$$

Using backward induction, the value function of the elite in the non-democratic era is given as:

$$V^{e}(N/\sigma_{(N)}, \sigma_{(D)}) = \max_{\sigma^{i} \geq 0} -\sigma^{i} + \mathcal{Z}^{e} + \rho(\sigma^{i}, \sigma_{(N)}^{e}/N)\left[\mathcal{R}^{e} + \beta V^{e}(N/\sigma_{(N)}^{e}, \sigma_{(D)}^{e})\right] + \left(1 - \rho(\sigma^{i}, \sigma_{(N)}^{e}, \sigma_{(N)}^{e}/N)\right)\left[\mathcal{R}^{e} + \beta V^{e}(D/\sigma_{(N)}^{e}, \sigma_{(N)}^{e})\right]$$

The First Order necessary Condition is:

$$\mu_{(N)}^{e} f\left[\mu_{(N)}^{e}\left((E-1)\sigma_{(N)}^{e} + \sigma^{i}\right) - \mu_{(N)}^{e} L\sigma_{(N)}^{e}\right][\Delta\mathcal{R} + \beta\Delta V^{e}] \leq 1$$

Where $\Delta V^{e} = \beta V^{e}(N_{n}/\sigma_{(N)}^{e}\sigma_{(N)}^{e}) - \beta V^{e}(D/\sigma_{(D)}^{e}, \sigma_{(D)}^{e})$.

The Second Order Condition is:

$$f'\left[\mu_{(N)}^{e}\left((E-1)\sigma_{(N)}^{e} + \sigma^{i}\right) - \mu_{(N)}^{e} L\sigma_{(N)}^{e}\right] < 0$$

The equations that characterize interior equilibrium are:

$$\mu_{(N)}^{e} f[\mu_{(N)}^{e} E\sigma_{(N)}^{e}][\Delta\mathcal{R} + \beta\Delta V^{e}] = 1$$

and

$$\mu_{(D)}^{e} f[\mu_{(D)}^{e} E\sigma_{(D)}^{e} - \eta][\Delta\mathcal{R} + \beta\Delta V^{e}] = 1$$

For the interior equilibrium to exist, an assumption is imposed:

Assumption: $\min[\mu_{(N)}^{e} f[0]\Delta\mathcal{R}, \quad \mu_{(D)}^{e} f[-\eta]\Delta\mathcal{R}] > 1$

Hence: $\sigma_{(D)}^{e} = \sigma_{(N)}^{e} + \frac{\eta}{\mu^{e} E}$ end of proof, this implies that elite will sufficiently invest in *de facto* power so as to upset the political power of the citizen

Some Comparative Analysis

Effect of Change in Rents ($\Delta\mathcal{R}$) $\partial\sigma_{(N)}^{e}/\partial\Delta\mathcal{R} = -\frac{f(\mu^{e} E\sigma_{(N)}^{e})}{f'(\mu^{e} E\sigma_{(N)}^{e})[\sigma\mu^{e}(\Delta\mathcal{R} + \beta E^{e}) + \beta\eta]}$

$f' < 0$ *therefore:* $\partial\sigma_{(N)}^{e}/\partial\Delta\mathcal{R} = -\frac{f(\mu^{e} E\sigma_{(N)}^{e})}{(\quad)(\quad)} > 0$

Similarly $\partial\sigma^*_{(p)}/\partial\Delta\mathcal{R} = -\dfrac{f(\mu^* E\sigma^*_{(N)} - \eta)}{f'(\mu^* E\sigma^*_{(N)} - \eta)[E\mu^*(\Delta\mathcal{R} + \beta Z^*) + \beta\eta]} > 0$

Given $\rho^* = F(\mu^* E\sigma^*_{(N)})$, and $\rho^* = F(\mu^* E\sigma^*_{(p)} - \eta)$; using chain rule it can be shown that:

$$\partial\rho^*/\partial\Delta\mathcal{R} = \partial\rho^*/\partial\sigma^*_{(N)} \times \partial\sigma^*_{(N)}/\partial\Delta\mathcal{R} > 0$$

$$\partial\rho^*/\partial\Delta\mathcal{R} = \partial\rho^*/\partial\sigma^*_{(N)} \times \partial\sigma^*_{(N)}/\partial\Delta\mathcal{R} > 0$$

Effect of Size of Elite Class (E)

$$\partial\sigma^*_{(N)}/\partial E = \frac{\beta\eta\mu^*\sigma^*_{(N)}}{f'(\mu^* E\sigma^*_{(N)})[E^2\mu^*(\Delta\mathcal{R} + \beta Z^*) + \beta\eta]}$$

Given that $f' < 0$; $\partial\sigma^*_{(N)}/\partial E = \dfrac{\beta\eta\mu^*\sigma^*_{(N)}}{f'(\mu^* E\sigma^*_{(N)})[E^2\mu^*(\Delta\mathcal{R} + \beta Z^*) + \beta\eta]} < 0$

Similarly: $\partial\sigma^*_{(p)}/\partial E = \dfrac{\beta\eta\mu^*\sigma^*_{(N)}}{f'(\mu^* E\sigma^*_{(p)} - \eta)[E^2\mu^*(\Delta\mathcal{R} + \beta Z^*) + \beta\eta]} < 0$

Given $\rho^* = F(\mu^* E\sigma^*_{(N)})$, and $\rho^* = F(\mu^* E\sigma^*_{(p)} - \eta)$; $\partial\rho^*/\partial E$ is ambiguous, however, from this result if E increases, the second term on the left hand side of the equation will decline. Thus, $\rho^* = F(\mu^* E\sigma^*_{(N)})$ will decline as E increases.

Effect of increase in citizens *de jure* power (η)

$$\partial\sigma^*_{(N)}/\partial\eta = -\frac{\beta f(\mu^* E\sigma^*_{(N)})}{f'(\mu^* E\sigma^*_{(N)})[E^2\mu^*(\Delta\mathcal{R} + \beta Z^*) + E\beta\eta]}$$

since $f' < 0$, then: $\partial\sigma^*_{(N)}/\partial\eta = -\dfrac{\beta f(\mu^* E\sigma^*_{(N)})}{f'(\mu^* E\sigma^*_{(N)})[E^2\mu^*(\Delta\mathcal{R} + \beta Z^*) + E\beta\eta]} > 0$

Similarly: $\partial\sigma^*_{(p)}/\partial\eta = -\dfrac{\beta f(\mu^* E\sigma^*_{(p)} - \eta)}{f'(\mu^* E\sigma^*_{(p)} - \eta)[E^2\mu^*(\Delta\mathcal{R} + \beta Z^*) + E\beta\eta]} > 0$

Thus: $\partial\rho^*/\partial\eta = \partial\rho^*/\partial\sigma^*_{(N)} \times \partial\sigma^*_{(N)}/\partial\eta > 0$; $\partial\rho^*/\partial\eta = \partial\rho^*/\partial\sigma^*_{(p)} \times \partial\sigma^*_{(p)}/\partial\eta > 0$