The Political Economy of Infrastructure Investments in Nigeria

Melvin D. Ayogu†
Center for International Development
Du Bois Institute, and Committee on African Studies
Harvard University
12 Quincy Street
Cambridge MA 02138-3879.
ayogu@fas.harvard.edu

April 2000

†This research was supported by a grant from the African Economic Research Consortium. I thank Stephen O’Connell, Hashem Dezhbakhsh, Robert Bates, Mohsin Khan, Ibi Ajayi, Peter Montiel, David Bevan, Shanta Devarajan for invaluable suggestions, to James Sochacki for the computational algorithm, and to participants in the Research Workshop on Positive Political Economy at Harvard University. Excellent research assistance was provided by Calistus Korinjoh. All errors and omissions are entirely mine.
Abstract

We estimate hypothetically optimal allocations of infrastructure investments. These optimal allocations are then compared to actual distributions to generate a measure of economic distortion, called "influence costs." Next we examine the extent to which these costs can be attributed to political influence on public-capital expenditure decisions. Thus our measure of economic distortion is used to benchmark the role of political influence.

Several interesting results emerge. First, the distribution of the distortion clearly shows the North dominating the South in terms of political influence, with the oil producing areas of the South faring the worst. Overall the losses exceed the gains, which is a net welfare loss to the nation. We offer several plausible explanations for this outcome based on the central role of the Military and its early capture by the North. In the face of increasing decentralization, a way out of future distortion in infrastructure investments is through the resolute pursuit of privatization of the delivery of infrastructure services.
Contents

1 Introduction 2
2 Country profile 4
3 Review of related literature 7
4 Empirical methodology 9
   4.1 Calibrating regional production functions 9
   4.2 Modeling political influence 12
   4.3 Measuring economic distortion 14
   4.4 Linking economic distortion and political influence 24
   4.5 Empirical results and inferences 26
5 Summary and concluding remarks 29
6 References 32

List of Tables

1 Nigeria: Chronology of Regime Changes 4
2 Regression Estimates of Output Elasticities 13
3 Economic Distortion 23
4 Federal Political Appointments Analyzed 30
5 Estimates of Political Influence 30
6 Estimates of the Effect of Being in Position, Year 1974 31
7 Estimates of the Effect of Being in Position, Year 1980 31
8 Estimates of the Control Variables 31

List of Figures

1 19-state structure of Federation of Nigeria 20
2 Spatial Profile of Economic Distortion 21
3 Spatial Profile of Economic Distortion (with emphasis on extreme values) 22
1 Introduction

This paper examines the influence of political factors on public investments in Nigeria. An assessment of the World Bank attributes most of the low growth rates in many African countries including Nigeria, to inefficiencies in the public sector.

The public sector lies at the core of the stagnation and decline in growth in Africa. By the mid 1980’s, the public sectors in most Sub-Saharan countries had taken on too much. They were intervening—with poor results—in activities where market work reasonably well. . . . They were also doing a poor job of providing such essential services as roads and primary schools.

With respect to public investment, adjustment programs have tried to ensure that resources are used wisely and that low-priority projects are eliminated. . . . Because there are no established benchmarks that would enable us compare the quality of public investment programs across countries, we are not able to systematically rank countries on the basis of their efforts to reform their public investment programs.

Creating a core program of the most worthwhile investment projects has been useful in improving the management of aid. . . . Such a program helped Ghana meet its most critical investment objectives. . . . But in many countries, noncore [sic] projects have remained in the public investment program and competed (often successfully) for funds.1

More recently, Canning (1998) suggested that the patterns in infrastructure stocks may be explained better by political economy rather than by economic efficiency. Canning finds this view plausible given the large-scale involvement of government in infrastructure investments.

One phase of this project measures the contribution of core infrastructures to private-sector production.2 The second phase uses, as inputs, estimates of the production parameters from the first phase, to approximate hypothetically-optimal allocations of infrastructure investments. These optimal allocations are then compared to the actual distributions to generate estimates of economic distortions, called influence costs. Last, we examine the extent to which these costs can be attributed to political influence in the arena where public capital expenditure decisions are made. Thus, our measure of economic distortion can be used to benchmark the role of political influence. The larger purpose of this research is to improve the quality of public investment by identifying costs associated with the political economy of infrastructure investments. Going forward, we hope that a better understanding of distributive politics can help us prevent political factors from hampering efficient policies on

2Core infrastructures are highways, water, electricity, and telecommunications—components expected to contribute most directly to private-sector output.
Infrastructure investments provide services that are part of the consumption bundle of residents and serve as an input into production. Infrastructures may be usefully classified as public capital goods. Public capital goods include highways and roads, mass-transit and airport facilities, education building, electricity, gas and water supply facilities and distribution systems, waste treatment facilities, correctional institutions, police, fire, and the judiciary. Only some elements of infrastructures show the characteristics of public goods (non-rivalry and non-exclusionary). Others are private and club goods. Power and water supplies are clear examples. Roads are a mixed case of public or club goods. Public services provided by core infrastructures may enter directly into individual private sector production functions or into an aggregated production function. On the other hand, “activities that maintain property rights—police services, courts, and national defense, can be viewed as affecting the probability that people retain the rights to their goods and thereby have an incentive to accumulate capital and produce” [Barro and Sala-I-Martin (1995)].

Empirical evidence on the interaction of regional economic performance and infrastructure investment is still scant. Conceptual agreement that infrastructure facilities benefit production needs to be reinforced by measures of the magnitude of these benefits. Besides, linking infrastructure investment and productivity is part of the broader goal of understanding the “institutional structure of production” [Coase (1992)]. Policy makers have come to appreciate that understanding the institutional structure of production is essential to designing meaningful economic reforms. Researchers in market economies have equally learned that institutions matter, and that price quotations on market commodities do not always carry sufficient information to guide economic decisions [Datta Chaudhuri (1990)].

With respect to infrastructures, it is crucial to understand the political basis for decisions made about public investment. Political considerations and the public good are not always in a conflict. However, some public expenditure decisions are made on the basis of political considerations with little regard to furthering the interests of the public. Decisions that are made in violation of economic principles provide an opportunity to measure political influence. This study explores one such opportunity by comparing hypothetically optimal allocations of core infrastructures with observed allocations to generate a measure of costs of political influence.
Beginning with the next section on country profile, the rest of the paper is organized as follows. Section 3 reviews related literature, Section 4 outlines the empirical methodology and presents the empirical estimates and inferences. Lessons and concluding remarks are in Section 5.

2 Country profile

Table 1: Nigeria: Chronology of Regime Changes

<table>
<thead>
<tr>
<th>Period</th>
<th>Event and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 1, 1963-Jan 13, 1966</td>
<td>The First Republic led by Sir Balewa</td>
</tr>
<tr>
<td>Jan 13, 1966</td>
<td>Coup led by Major Nzeogwu</td>
</tr>
<tr>
<td>Jan 16, 1966</td>
<td>Power handed to General Ironsi</td>
</tr>
<tr>
<td>Jul 29, 1966</td>
<td>Counter coup with power to General Gowon</td>
</tr>
<tr>
<td>Jul 29, 1974</td>
<td>Coup by General Murtala Mohammed</td>
</tr>
<tr>
<td>Feb 13, 1976</td>
<td>General Mohammed assassinated in an aborted coup</td>
</tr>
<tr>
<td></td>
<td>General Obasanjo becomes Head of State</td>
</tr>
<tr>
<td>Oct 1, 1979-Oct 1, 1983</td>
<td>The Second Republic led by Alhaji Shagari</td>
</tr>
<tr>
<td>Dec 31, 1983</td>
<td>Coup by General Buhari</td>
</tr>
<tr>
<td>Aug 27, 1985</td>
<td>Coup by General Babangida</td>
</tr>
<tr>
<td>Aug 26, 1993</td>
<td>General Babangida steps down under pressure</td>
</tr>
<tr>
<td></td>
<td>Mr. Shonekon appointed interim civilian President</td>
</tr>
<tr>
<td>Nov 17, 1993</td>
<td>Mr. Shonekon deposed in a bloodless coup</td>
</tr>
<tr>
<td>Jun 8, 1998</td>
<td>General Abacha dies from illness</td>
</tr>
<tr>
<td></td>
<td>General Abubakar appointed Head of State by the ruling junta</td>
</tr>
<tr>
<td>May 29, 1999</td>
<td>General Obasanjo sworn in as elected Head of State</td>
</tr>
</tbody>
</table>

Nigeria: Nigeria is a federation comprising currently of thirty six states and a Federal Capital Territory located in Abuja. It is the most populous country in Africa with immense physical and human diversity. Its physical features range from rain forest to desert, and the people are divided into about 250 different ethnic groups. Population statistics are widely disputed by demographers. Nonetheless, four groups together make up 65 percent of her population—the Fulanis and the Hausas in the North, the Ibos in the Southeast, and the Yorubas in the Southwest. The Edos, Ibibios, Kanuris, Nupes, Tivs, Chamba, Eko, and Ijaws are important, even if small groups. Islam is the dominant religion in the North, accounting for about 47 percent of the population. Christianity that is dominant in the South accounts for about 30 percent of the population. The rest of the population hold
traditional beliefs.

The economy is the second largest in sub-Saharan Africa, ranking behind South Africa and possessing one percent of the world’s proven petroleum reserves. By 1985, oil revenue accounted for over 85 percent of all earnings from foreign exchange. Agriculture employs more than half of the total population, mostly on subsistence level, but contributes only about 25 percent of the national output. Agricultural exports, formerly the country’s main export commodities are now of less importance.

At independence in 1960, Nigeria adopted a parliamentary system of government in a federation comprised of three regions—Northern, Western and Eastern. Each of the three major political parties that emerged at independence had its power base in one of the regions. The Northern People Congress [NPC] in the North, the Action Group [AG] in the West, and the National Convention of Nigerian Citizens [NCNC] in the East. The first post independence government was formed by NPC under the leadership of Abubakar Tafawa Balewa (a Northerner) as the Prime Minister.

If not the proximate cause of Nigeria’s first military intervention, then the NPC’s attempt to use its control of the federal center to try to alter the balance of power decisively in its favor may have at least escalated the problems that lead to the first coup d’ état. According to Joseph (1997), the NPC employed that power in the following ‘crucial events: producing a highly disputed census count favorable to itself in 1962/3; imposing a minority faction of the Action Group party on the Western region in 1962/4; manipulating the results of the 1964 federal election, especially in the North; and finally, supervising the perpetration of what a normally temperate student of Nigerian Politics calls “the crooked Western election of October 1965.”’

On January 13, 1966, a group of army officers led by Major Nzeogwu (South) attempted an overthrow of the Government of Balewa. However, troops loyal to that Government, under the command of Major General Aguiyi-Ironsi (South), General Officer Commanding the Nigerian Army, succeeded in foiling the coup attempt. Nonetheless, a combination of events compelled the Council of Ministers to decide on a voluntarily hand over of the Federal Government of the Federation to the Armed Forces. These events include the failure of the coup attempt, especially in the West, the general loss of control in the North, and the absence of the President (South) who was out of the country for a medical treatment. The decision of the Council of Ministers was announced in a radio broadcast on January 16, 1966
by the Acting President, Dr. Nwafor Orizu (South, the Senate President). Six months later, a successful coup placed Lieutenant Colonel Yakubu Gowon (North) in command. In 1967, the Eastern Region seceded (as the Republic of Biafra) under the leadership of Lieutenant Colonel Odumegwu Ojukwu. This rebellion was put down after 30 months of a bloody civil war.

In 1975, the regime of General Gowon was overthrown by Major General Murtala Muhammed (North) who was subsequently assassinated in a failed coup attempt. Lieutenant General Olusegun Obasanjo (South) took over the leadership of Muhammed’s regime and presided over the transfer of power to an elected civilian administration of Shehu Shagari (North) under a new constitution that came into force in 1979.

Shagari was elected for a second term but was then deposed by Major General Buhari (North). Buhari’s government worked at ending corruption and instilling discipline. He was overthrown in August 1985 in a bloodless coup led by Major General Ibrahim Babangida (North). Babangida promised a return to civilian rule under a new constitution approved in 1989. Nine new states were created in 1991 and six more in 1996.

Legislative elections were held in 1992 and the Presidential election in June 1993. Unfortunately, Babangida annulled the result of the presidential election of June 1993 but public anger forced him to step down as scheduled in August of the same year. An appointed interim civilian president, Ernest Shonekon (South) was ousted on November 17, 1993 by General Sani Abacha (North) who reimposed military rule.

Abacha promised elections in 1998 but sought subsequently to succeed himself as a civilian president. He died unexpectedly in June 1998 and was succeeded by General Abubakar (North). Abubakar’s regime organized a nation-wide election that was then part of yet another promised return to democracy. The latest election returned former military dictator, Lieutenant General Obasanjo as a civilian President to head the new Republic. On a promise of strong moral leadership, General Olusegun Obasanjo was sworn in as the President in May 1999.

Thirteen years of military rule between the First and Second republics led to many changes in the federal structure of Nigeria. Chief among these was the ascendancy of the Federal Government, made possible from the enormous concentration of wealth from petroleum resources particularly in the 1970’s. It was during this period that may key elements of accommodation were introduced—quota system for all federal recruitment, rep-
presentation of the states in national governmental bodies, and proportional allocation of federal resources [Jinadu 1995]).

3 Review of related literature

The connection between infrastructures and economic development is a major focus of the development literature. An early treatment was provided by Rosenstein-Rodan (1943). Much later, Aschauer (1989a,b) linked infrastructures to productivity-slow down in the USA and attempted econometrically to develop empirical evidence of the connection postulated by Rosenstein-Rodan (1943). Most of the studies in this area have focused on the United States and other developed countries. The issues investigated have been whether a shortage of infrastructure investment ever occurred and how such a shortage could be established. Gramlich (1994) estimates that these issues have generated at least forty econometric studies.

The literature defines infrastructure capital in two basic ways. The broader definition distinguishes a conceptually sensible category of capital stock used by large capital-intensive natural monopolies that in individual countries may or may not be privately owned. The other approach is an expedient one used in research. It identifies “infrastructure capital” with the tangible stock owned by the private sector. The literature also notes that, as with any public good, some benefits of infrastructure capital such as improved security, time saving, improved health, and a cleaner environment are magnitudes that are difficult to measure and thus are seldom included in official measures of national output. “Hence it will also be difficult to relate infrastructure to [all of] its goals, or changes in them” [Gramlich (1994)]. We adopt the broader approach here, in measuring the tangible stock of core infrastructures regardless of the structure of its ownership.

A strand of the literature estimates the impact of infrastructures on productivity by imposing the translog [Cobb-Douglas] flexible functional form in which the influence of public capital is explicitly modeled. Examples are Aschauer (1989a,1993), Holtz-Eakin (1992), and Fernald (1993), to name a few. Other authors such as Aaron (1990), Jorgensen (1991), and Tatom (1991) criticize this work on two grounds. First, the critics contend that estimated rates of returns on public capital are overly optimistic. They also note the possible misspecification of the dynamic effect exercised by the public capital stock. They
reason that some of this stock may have a long gestation period that lacks a short-term impact on the supply of aggregate output. This problem makes the high rates of return even more implausible.

These and other econometric problems have been addressed to various extent in recent research.\(^3\) Some [Rubin (1991) for example] have employed a rich variety of definitions of the appropriate stock of capital. The particular definition that yields the highest output elasticity is core infrastructures. Unfortunately, a high elasticity perpetuates the puzzle. Gramlich recommends use of pooled time series and cross-section data across expenditure units as a way of mitigating the principal econometric problems raised in the previous studies. This approach gives more plausible estimates of the implied rate of return on infrastructure investment. Munnell (1990), Eisner (1991), Eberts (1990), Holtz-Eakin (1992), and Ayogu (1998) followed this approach. Munnell (1992) summarizes some of these findings.

Easterly and Levine (1994) attempt to explain “Africa’s growth tragedy” using a regression on a collection of variables thought to explain growth. One variable that does not show up as significant is their measure for infrastructure investment. This finding contrasts with the World Bank’s attribution of Africa’s growth shortfall to the poor state of its infrastructure. However, in a country case study, using disaggregated data on core infrastructure variables at the regional level, Ayogu (1999) found infrastructures to be highly significant jointly but not individually. In any event, there is a need to be circumspect in comparisons across empirical findings because of the disparate measures of infrastructures that are a feature of these studies.

Aschauer’s (1989a) influential paper claimed to find large effects on US productivity growth. Canning and Fay (1993), and Easterly and Rebelo (1993) report similar findings for a cross-country sample although an earlier cross-sectional study by Khan and Reinhart (1992) failed to find significant growth effects. Easterly and Rebelo used consolidated public-sector investment in transport and communications, while Canning and Fay employed physical measures of infrastructures such as kilometers of roads and railroads per worker. Easterly and Levine (1994) find no significant effect of either roads, railways or electricity generation.

Polenske (1994) summarizes the state of both the theoretical and empirical literature on

\(^3\)Econometric problems such as causality issues, simultaneity bias, specification errors and nonstationarity.
public infrastructure and productivity. She finds that competent researchers have reached opposite conclusions on the relationship between regional economic performance and infrastructure expenditure and views this as convincing evidence that more work is needed on the topic. A review of the empirical research reveals that the productivity effects of public capital vary from a negative to a positive and from small to large with causality working in either direction. The finding of negative productivity effects can also be consistent with the possible existence of a distorted mix of infrastructure types in an economy. According to Polenske (1994):

Theory currently provides little guidance regarding possible outcomes, but there are three critical issues which mainly concern analysts in industrial economies although applicable to developing countries as well: (1) The development of clearly stated theoretical expectations concerning the economic impact of public investment ... that will lead to the design and testing of improved models for gauging the productivity of public investment. (2) The improvement of data used in empirical research, particularly regarding infrastructure lives, depreciation, and the role of maintenance ... in the growth of net capital stock. (3) The changing institutional arrangement that affect public investment, especially in view of the current emphasis on privatization.

4 Empirical methodology

4.1 Calibrating regional production functions

This section briefly describes Phase One of this study, namely to extract the empirical estimates of the parameters of the regional production functions. The basic quantitative approach comes from Ratner (1983). Ratner is the first to explicitly add public capital to the production function to test whether the marginal product of public capital is positive (with respect to private-sector production). The model assumes that the business sector production function can be approximated with a Cobb-Douglas flexible functional form:

$$Q_t = Ah_t^a k_t^b g_t^s e^{rt+vt},$$

where $A$ is a scale parameter, $h_t$ measures business sector hours, $k_t$ measures the flow of services from $K_t$, the inflation-adjusted stock of private capital at the end of the previous year. $g_t$ measures the flow of services from $G_t$, the public capital stock at the end of the previous year. $r$ is the rate of disembodied technical change, $t$ is a time trend, and $v_t$ is the error term. The utilization rate for the flow of private capital services is assumed to be measured by an appropriate index of economic activity $c_t$, while the utilization rate for the
flow of infrastructure services is assumed to be measured by a quality index $\theta$. Therefore, $g_t$ equals $\theta G_t$, and $k_t$ is $c_t K_t$.

The production function allows returns to scale that are either decreasing, constant or increasing. Also, equation 1 can be log-transformed to:

$$\ln\left(\frac{Q}{cK}\right)_t = \ln A + \alpha \ln\left(\frac{h}{cK}\right)_t + \delta \ln\left(\frac{\theta G_t}{c_t K_t}\right)_t + rt + v_t.$$  

Some economic meanings can be given to the exponents $\alpha$, $\beta$, and $\delta$. Each exponent indicates the relative share of that input in the total product while the sum of the exponents measures the Return to Scale. In equation 2, these exponents are interpreted as (partial) elasticities of output with respect to a unit of that input. The goal is to estimate the values of these exponents.

The variables for core infrastructures are, (1) kilometers of "motorable" roads, (2) percentage population with access to potable water through either stand pipe or house connection, (3) electric power consumed as (an admittedly unsatisfactory) proxy for power infrastructure, and (4) number of telephone main lines.\(^4\)

We use a model that captures the relationship between regional economic performance and installed infrastructure, while allowing for characteristic differences in the states that constitute the Federation of Nigeria:

$$y_{it} = \alpha_i + \sum_{j=1}^{K} \beta_{ij} x_{ijt} + e_{it}$$

where $i = 1, 2, \ldots, N$ denotes a cross sectional unit (a state or political region), and $t = 1, 2, \ldots, T$ denotes a given period. Thus, for region $i$ in period $t$, $y_{it}$ is the value of the

\(^4\)A telephone main line connects the subscribers equipment to the switched network and has a dedicated port at the Exchange. The correct indicators for power infrastructure are the capacity to import energy (transmission infrastructure) and the spannage (distribution infrastructure). The relevant data sets comprising specifications and capacities would include total circuit length of high tension transmission lines in kilometers, total injection substation capacity in megavolts amps [MVA], total circuit length of low tension transmission lines in kilometers, total installed distribution capacity in MVA (composed of capacities of distribution transformers and distribution substations). Regrettably, such proper data sets were unavailable.

Some researchers including the World Bank in its World Development Report 1994 have used installed capacity of electricity generating plants as a proxy for power. However, we prefer power consumed as an indicator of the measurement of the contribution of electricity to productive activities. The reason is that considerable amounts of generated power are lost in the transmission and distribution process (system losses). For a detailed profile of the data set used in Phase One analysis, interested readers are referred to Ayogu (1999).
dependent variable (output), and \( x_{ijt} \) is the value of the \( j \)th non stochastic explanatory variable. The random error term \( e_{it} \) is assumed to have a mean of zero, and a constant variance. \( \alpha_i \)'s and \( \beta_{ij} \)'s are unknown response coefficients to be modeled.

Ideally, each region should be estimated separately. Unfortunately data limitation precludes this option. Therefore, we proceed by reasoning that there may be correlation between the error terms in each of the set of equations. It is plausible that these errors are rooted in some common unmeasurable or omitted factors, and so should be expected to exhibit some (contemporaneous) correlation. Also given that investments in infrastructure are lumpy and occur at discrete intervals, we do not consider serial correlation of the error terms to be a major concern. The maintained hypothesis of “no serial correlation” is verified with the Durbin-Watson statistic, reported with the regression estimates.

In addition, it is assumed that with contemporaneous correlation,

\[
E(e_{it}e_{jh}) = \begin{cases} 
\sigma_{ij} & \forall \ t = h \\
0 & \forall \ t \neq h 
\end{cases}
\]

Thus we have as the contemporaneous variance-covariance matrix of the joint disturbance vector,

\[
\Sigma = \begin{bmatrix} 
\sigma_{11} & \sigma_{12} & \ldots & \sigma_{1N} \\
\sigma_{21} & \sigma_{22} & \ldots & \sigma_{2N} \\
\vdots & \vdots & \ddots & \vdots \\
\sigma_{N1} & \sigma_{N2} & \ldots & \sigma_{NN} 
\end{bmatrix}
\]

For a given political region, state \( i (= 1, \ldots, N) \), within a period \( t (= 1, \ldots, T) \), where for convenience the time subscripts are suppressed, we have:

\[
y_i = \alpha_1 + \sum_{i=2}^{N} (\alpha_i - \alpha_1) D_i + \sum_{j=1}^{K} \beta_{1j} \theta_j x_{ij} + \sum_{i=2}^{N} \sum_{j=1}^{K} (\beta_{ij} - \beta_{1j}) Dx_i + \omega L_i + rt + e_i
\]

where,

\[
D_i(i = 2, \ldots, N) = \begin{cases} 
1 & \text{for an observation in state } i \\
0 & \text{else}, 
\end{cases}
\]

\[
Dx_i(i = 2, \ldots, N) = \begin{cases} 
\theta_j x_{ij}(j = 1, \ldots, K) & \text{for an observation in state } i \\
0 & \text{else}; 
\end{cases}
\]

\( \theta_j \) is the quality index for variable \( j \), and \( L_{it} \equiv (\frac{\theta_i}{\omega})_t \) is the labor-capital ratio for state \( i \). The measure for \( h \) is the economically active labor force. \( \theta_{it} \) is the rate of employment in state \( i \) in year \( t \). Therefore \( \theta_{it} h \) is the quantity of labor. The choice of the reference
state \((i = 1)\) is arbitrary. Equation 5 corresponds to a regression of \(y\) on \(D\), \(x\), \(Dx\), and a constant term. Here, the constant term does not only incorporate the usual meaning of measuring the value of output when the value of the inputs is zero ("autonomous output"). It also measures the scale parameter, and for the reference state, incorporates the individual effect as well. \(D\) is the individual effect for all the other states (i.e., \(\forall i \neq 1\)), \(x\) is the set of infrastructure variables, and \(Dx\) is the “interactive dummy” which captures the impact of the individual effect on infrastructure. All the necessary transformations of the variables to conform to the functional form specified in Equation 2 are made, with output \(y \equiv \ln\left(\frac{Q_t}{C_tK_t}\right)\) and the infrastructure variables summarized by \(\ln\left(\frac{G_t}{C_tK_t}\right)\).

We gain efficiency by jointly considering all the equations (pooling the cross section) to use the contemporaneous correlation across equations. An efficient method of estimation is the method of generalized least squares [GLS], particularly the Seemingly Unrelated Regression procedure. This version of the GLS obtains single equation estimates of the parameters of the model, and uses these to form a consistent estimate of the residual covariance matrix of the structure specified in Equation 4. Estimates of the output elasticities are tabulated in Table 2.

These output elasticities are the parameters of the respective regional production functions. Through them we can characterize the production technology by computing the "Returns to Scale." But of immediate relevance is that by calibrating the regional production functions, we are able to subsequently perform the numerical optimization for hypothetically reallocating the infrastructure types. As have been noted in Polenske (1994), documented in World Bank (1994b), in Munnell (1992), and supported by the findings here, "the productivity effects of public capital vary from a negative to a positive and from small to large."

### 4.2 Modeling political influence

In this section, we compare hypothetically optimal allocations of core infrastructures with realized distributions to generate a measure of economic distortions. Then we examine the extent to which these economic distortions can be explained by political factors, particularly political influence.

The respective marginal product of the infrastructure types can be derived from their output elasticities through \(\delta = (G/Q) \frac{\partial Q}{\partial G}\). \(\delta\) is the partial elasticity of output, \(G\) is the infrastructure and \(Q\) is the output.
Table 2: Regression Estimates of Output Elasticities

<table>
<thead>
<tr>
<th>state</th>
<th>water</th>
<th>power</th>
<th>road</th>
<th>telecom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anambra</td>
<td>0.88</td>
<td>-0.50</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Bauchi</td>
<td>-0.08</td>
<td>-0.50</td>
<td>0.10</td>
<td>1.8</td>
</tr>
<tr>
<td>Bendel</td>
<td>-2.1</td>
<td>0.51</td>
<td>0.31</td>
<td>-1.0</td>
</tr>
<tr>
<td>Benue</td>
<td>0.91</td>
<td>-0.32</td>
<td>-0.84</td>
<td>3.41</td>
</tr>
<tr>
<td>Borno</td>
<td>-0.31</td>
<td>-2.04</td>
<td>6.65</td>
<td>-2.95</td>
</tr>
<tr>
<td>Cross River</td>
<td>0.03</td>
<td>-0.34</td>
<td>0.76</td>
<td>-0.55</td>
</tr>
<tr>
<td>Gongola</td>
<td>0.35</td>
<td>.28</td>
<td>2.31</td>
<td>0.42</td>
</tr>
<tr>
<td>Imo</td>
<td>-4.31</td>
<td>-1.12</td>
<td>-0.07</td>
<td>-5.61</td>
</tr>
<tr>
<td>Kaduna</td>
<td>0.56</td>
<td>-0.71</td>
<td>0.16</td>
<td>0.25</td>
</tr>
<tr>
<td>Kano</td>
<td>-0.56</td>
<td>1.72</td>
<td>-0.32</td>
<td>0.25</td>
</tr>
<tr>
<td>Kwara</td>
<td>0.82</td>
<td>-0.13</td>
<td>-0.97</td>
<td>0.29</td>
</tr>
<tr>
<td>Lagos</td>
<td>0.41</td>
<td>-0.04</td>
<td>0.08</td>
<td>-1.08</td>
</tr>
<tr>
<td>Niger</td>
<td>-0.01</td>
<td>-0.37</td>
<td>2.69</td>
<td>-0.36</td>
</tr>
<tr>
<td>Ogun</td>
<td>-0.29</td>
<td>-0.11</td>
<td>0.6</td>
<td>-0.53</td>
</tr>
<tr>
<td>Ondo</td>
<td>-0.04</td>
<td>0.27</td>
<td>0.31</td>
<td>0.35</td>
</tr>
<tr>
<td>Oyo</td>
<td>-11.7</td>
<td>-0.93</td>
<td>0.46</td>
<td>9.2</td>
</tr>
<tr>
<td>Plateau</td>
<td>-0.09</td>
<td>0.29</td>
<td>0.19</td>
<td>-0.71</td>
</tr>
<tr>
<td>Rivers</td>
<td>-1.69</td>
<td>1.07</td>
<td>0.45</td>
<td>-8.94</td>
</tr>
<tr>
<td>Sokoto</td>
<td>1.01</td>
<td>0.12</td>
<td>0.35</td>
<td>1.0</td>
</tr>
<tr>
<td>Labor</td>
<td>1.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Progress</td>
<td>-0.035</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The equation estimated is \( y_i = \alpha_1 + \sum_{i=2}^{N} (\alpha_1 - \alpha_i) D_i + \sum_{j=1}^{K} \beta_j x_{ij} + \sum_{i=2}^{N} \sum_{j=1}^{K} (\beta_{ij} - \beta_{1j}) D_i + \omega L_i + rt + e_i. \)

The sum of the coefficients of water, power, road, and telecom can be interpreted as the partial elasticity of output with respect to a normalized unit of public capital. It indicates the approximate relative share of public capital in the total product.

The basic theory of political influence that we follow is due to Ferejohn (1974) which states that the distribution of influence arises from four sources: (1) From institutional prescriptions about who shall have authority in particular fields, (2) from the skills of different individuals, (3) from traditional practices and habits, and (4) from common agreement. According to Ferejohn: “If a program has geographically divisible components, government officials who are most strategically situated should receive a disproportionate share of its benefits. An official should be regarded as influential if the alternatives he most prefers prevail in competition against those he least prefers and if these favorable allocations are unexplainable in terms of either objective criteria or other simple bureaucratic decision rules.”

To derive the level of political influence of politicians and bureaucrats in the model that follows, we construct a binary variable that maps political positions to states of origin.
of appointees and to years position held. In selecting the positions to analyze, we tried to reflect institutional prescriptions of authority over public-capital investment decisions. Thus our choice of political positions shown in Table 5 comprise members of the capital projects committee (who also are committee members in the National Planning exercise), as well as other positions considered relevant per Ferejohn’s theory of political influence—“some chairpersons, ministers, and heads of state-owned enterprises are more influential than others simply because the issues they deal with are more important, perhaps to other members of the cohort.”

4.3 Measuring economic distortion

Economic distortion is measured as the gap between “potential” output \([\text{GDP-star}]\) and actual output \([\text{GDP}]\). Potential output is that output obtained when the core infrastructures are optimally redeployed.\(^6\) Optimal redeployment of inputs means that the marginal products of the infrastructures are equalized across regions. Although, infrastructures once installed cannot be reallocated (the classic putty-and-clay characteristics of capital), the overall stock can be equalized at the margin by making future allocations (to a region) conditional on the marginal product of the existing stock in that region. Therefore, even though flows are clearly the policy instruments, it makes more sense to optimize stocks of infrastructure facilities.

By hypothetically reallocating the existing infrastructure stock, we obtain, in principle, the optimal allocation of types of investment expenditure across regions, given the level of total capital available for distribution. We acknowledge that the total capital stock available for distribution is not exogenous to the political process. Presumably some powerful states (defined by their representatives) can influence more of a particular infrastructure type in which they are interested. As well, the composition of interest groups influences the content of public spending (in this case, the distribution of allocation between infrastructure types), while the structure of interest groups influences the level. We abstract from these important issues and instead focus on how aggregate stock is divvied up regardless of how the “goodies

\(^6\)Although the present focus is on optimality along a single dimension, we acknowledge distortion in the mix of infrastructure bundles. To reallocate these within states would require shadow prices on each individual capital stock. Certainly an interesting extension, but obtaining such prices poses a formidable challenge. In fact, Polenske (1994) thinks that some of the negative marginal products found in many of the empirical studies on infrastructure effects, can be due to the distorted mix of infrastructure bundles.
in the pot” were secured.

To derive the first-best allocation of the stock of infrastructures (i.e., redress the distorted mix), we solve an output optimization program under the following simplifying assumption—that the cost of installing a unit of an infrastructure facility is the same across the regions. Formally, let $i$ (as usual) denote a region, and $t$ a given period. Then $q_{it}$ is the output of region $i$ in period $t$, and $x_{ijt}$ is the nonnegative value of $j$th infrastructure type for $i$ in period $t$. $\beta_{ij}$’s are real-valued parameters. We may specify each period’s optimization program as finding the vector $x^*$ that maximizes national output subject to $K$ linear constraints:

$$\{x^*\} \text{argmax } Q = \sum_{i=1}^{n} q_i = \sum_{i=1}^{n} \left( \prod_{i=1}^{K} A_i x^\beta_{ij} \right)$$

subject to ($K$ linear constraints):

$$\sum_{i=1}^{n} x_{ij} = C_j, \quad j = 1, \ldots, K,$$

where $C_j$ is the stock of infrastructure type $j$ available for distribution to $n$ regions in period $t$. That is,

$$q_1 = A_1 x_1^{\beta_{11}} x_2^{\beta_{12}} \cdots x_K^{\beta_{1K}}$$

$$q_2 = A_2 x_1^{\beta_{21}} x_2^{\beta_{22}} \cdots x_K^{\beta_{2K}}$$

$$\vdots$$

$$q_n = A_n x_1^{\beta_{n1}} x_2^{\beta_{n2}} \cdots x_K^{\beta_{nK}}$$

Furthermore, we define

$$\tilde{Y} = q^* - q$$

as the output gap, $q^*$ as the potential output, and $q$ as the actual output. This definition of the gap is convenient because it provides a single measure for each region per year rather than $K$ measures for the $K$-infrastructure types. Thus $\tilde{Y}$ is a partitioned matrix containing $n$ submatrices as elements. That is,

$$\tilde{Y}' = [q_1 \ q_2 \ \ldots \ q_n],$$

---

3Optimizing access-to-water requires several simple but necessary steps of transforming variables. First we convert percentage of the population with access to water to actual population numbers. Then we re-allocate across the regions, the resulting aggregate number of residents with access to water. The reallocated number for each region is translated back to “regional percentage access” before inserting that as the value for water (infrastructure) in the prediction equation for potential output.
where

\[ q'_i = [q_{i1}, q_{i2}, \ldots, q_{iT}] \quad i = 1, \ldots, n, \ t = 1, \ldots, T. \]

At least two possible sources of output gap exist between potential and actual GDP: One
is from having more or less infrastructure than is necessary, or a distorted mix. The other
is random variation as captured by the error term in the regression equation for GDP-star.
Eliminating the random variation allows us to focus on the distortions that arise from the
sub-optimal use of infrastructure inputs. Therefore, we redefine each measure of output gap
\( Y \) to be the difference between a fitted output \( \hat{q} \) and an actual output \( q \). Thus,

\[ Y = \hat{q} - q, \]

represents the vector of real output gap across all regions that may be attributed to a
distorted mix of infrastructure stock. In particular,

\[ \hat{q} = \hat{\alpha} + \hat{\beta} \ln\left(\frac{X^*}{K}\right) + \hat{\omega} \ln\left(\frac{L}{K}\right) + \hat{\tau}t \]

where \( \hat{\beta} \)'s are the output elasticities calibrated earlier, \( X^* \) is the vector of optimally
allocated infrastructure stock, while \( \frac{L}{K} \) and \( t \) are respectively, the actual labor-capital ratio
and disembodied technical progress. Estimates of the economic distortion, \( Y \), are given in
Table 3.

Figure 2 projects a spatial profile of the distribution of the economic distortion in terms
of gains and losses. Arrayed by geopolitical zones beginning with the South-South, South-
East, South-West, Central, North-East, and ending at the North-West, there is a striking
pattern that shows the North and the South-West zones as gainers under the status quo,
with this trend most evident in the North (even with Oyo state as the biggest single gainer).8
The South-South and South-East are the distinct losers. Moreover, the losses imposed on
the losing regions are much more dense than the gains to the winners (this is most clear in
Figure 3). These losses are concentrated on fewer number of states and so on a per loser-
state basis, are more intense than are the per winner-state gains which are shared among
many more states. It is possible that this asymmetry could make the gainer less sensitive to
the severity of the burden imposed on the losers (until recently when things took a violent

---

8Geopolitical zoning is part of the contemporary efforts to reflect the “Federal Character,” which on the
one hand is an implicit acknowledgment of the lopsided distribution of resources in the past. On the other
hand it represents a commitment in principle to remedy the imbalance henceforth. A visible sign of this
commitment is the establishment of The Federal Character Commission with a secretariat in Abuja.
turn leading to the unfortunate political-motivated hanging of one of South-South most illustrious son.) In looking to Figure 3, it is clear that the absolute level of losses suffered by at least one state among the losers far exceeds any gain by an individual state inclusive of Oyo State, the outlier.

How may we explain Oyo State which dominates the landscape of the gainers? Its preeminence is exceeded only by the depravity of the South-South zone, particularly Rivers State from where incidentally the bulk of Federation revenue is derived. There are two ways that we can account for the spectacular showing of Oyo State. The first is based on initial conditions which in our empirical model is captured as individual differences (“fixed effects”) and also by allowing these individual differences to influence the marginal productivity of own state’s infrastructure (through an interactive dummy). The other is the quality of governance and internal (regional) politics. We elaborate on both themes below.

The former Western State (a de facto extension of the ancient Oyo Empire) boasts a string of first’s in infrastructure-related factors—the first stadium in Nigeria (Liberty Stadium), the first most populous modern city in Nigeria (Ibadan, also the seat of Western State government), the first University (University of Ibadan), as well as the first teaching hospital, the first broadcasting station in Nigeria, and the home of an important road transportation nexus (Ibadan) from Lagos to the Eastern and Northern regions. A complimentary explanation is that these first’s and other resources meant for the South West may have been disproportionately concentrated in the area described by 1985-Oyo State. If so, this pattern may have been part of the catalyst for the separatist movement that carved out from Western State, the present-day Oyo, Oshun, Ekiti, Ondo and Ogun States from what was basically the old Oyo Empire. Although Ondo and Ogun States were carved out of Western State in 1967, the two leading institutions of higher learning and one world-class research center remained within Oyo State. These are the University of Ibadan, the nation’s leading center in medicine and health sciences; the University of Ife, a leading center in engineering and humanities, and home of Africa’s Nobel Price laureate, Wole Soyinka; and the World-class International Institute of Tropical Agriculture.

Using quality of governance as another factor, the former Western Region was governed

---

9The present regime of President Obasanjo has tackled head on, the issue of the Oil Mineral Producing Areas, resulting in the passing of a legislation earlier in the year, to uplift the plight of the people of these areas.
by the late Chief Obafemi Awolowo who was very much development-oriented in his approach to governance. In addition to being one of Nigeria’s premier nationalists, he was the first leader of the opposition group in the First Republic. The first Premier of Western Region, later jailed for treason, was released and became the Minister of Finance during the period of the Nigerian civil war.\footnote{Western Region comprises Oyo, Ondo, Ogun, and Lagos States. The difference between Western Region and Western State is that the latter does not incorporate Lagos.} Chief Awolowo was several times a presidential candidate, but is most remembered for his foresight and dedication to the cause of economic development in the Western Region. In the history of primary education in Nigeria, he outdistanced everybody with his early introduction of free primary education in the West. Finally, one cannot lose sight of the fact that the South Westerners (Yorubas) benefitted politically even if marginally, from the vacuum created by the full secession of the South-East (as Biafra) and the partial secession of the MidWest from the Federation.

We can account for the aggregate dominance by the North through noting the following broad historical facts (the micro-accounting is done in the next section). To understand Northern dominance is to appreciate how control of the military has meant control of the government. Hence the Northern dominance in the military is coextensive with her political dominance. The military has made the primacy of the North in the political affairs of the country possible. The military have been in charge for 29 out of the 39 years of independence.

Nigeria had seven military Heads of State, out of which five were from the North and two from the South. The two Southern Heads ruled for a cumulative period of 4 years while the five Northern Heads account for the remaining 25 years. Moreover, both Southern Heads of State came to power by accident of history: Aguiyi Ironsi on the heels of the failed 1966-coup and Obasanjo upon the assassination of Murtala Muhammed.

The next for consideration are the Ministers of Defense and Chiefs of Army Staff. These positions that arguably are the teeth of the Nigerian military have since independence been dominated by the North. The country has produced 14 Chiefs of Army Staff out of which 12 were Northerners and 2 from the South (with a collective term of 5 years and 2 months). Of all the Ministers of Defense, only once has a Southerner held that portfolio and even then it was a combined portfolio with the Head of State (by Obasanjo). Defense portfolio is so sensitive that it is given to only trusted loyalists, otherwise the incumbent Head of State integrates it into his office. In fact, for all cases except Gowon and Babangida regimes, when
the portfolio was held by someone other than the Head of State, there has invariably been either a coup d’état or an attempted coup d’état.

Of all the National Development Plans (and this is where public capital projects are initiated), only two were initiated by civilian regimes and even those were never fully implemented as the military cut into both eras (1962–68, and 1981–85). The inclusion of the principle of “Federal Character” in the 1979 Constitution amplified the distributive rationale for state creation. It meant a quota system for all Federal recruitment, representation of states in national governmental bodies, and proportional allocation of Federal resources. And the States and Local Governments creation have been done by military regimes under Northern Heads of State. To pick one key ministry relating to infrastructures, the Ministry of Mines and Power which is the line Ministry controlling the power utility company, we note that of the 20 Ministers since independence in 1960, only 4 were from the South. And directly to the National Electric Power Company, only 2 out of its 7 former Chief Executives were Southerners.

Finally, it is important to bear in mind that the issue is not a zero-sum game. Reallocating infrastructure expenditure (as analyzed herein) is not predicated on remedying structural or social inequities but on the basis of its capacity to increase the overall size of the national income. In a fairly developed country with a political regime that is functioning reasonably well, it may be possible to discern the preferences of the various interest groups. And what we call distortion in this study may well represent trade-offs between groups to address goals other than growth. However, in a system with widespread poverty and patchy growth, the issue of economic distortion centered around growth issues becomes such a dominating factor that infrastructure distortion linked to GDP growth is eminently justified.\textsuperscript{11}

\textsuperscript{11}We are grateful to Edward Schwartz for this perspective.
Figure 1: 19-state structure of Federation of Nigeria

Note: Nigeria currently has 36 states and a Federal Territory. Our analysis is based on the old 19-state structure, consistent with our data.
Figure 2: Spatial Profile of Economic Distortion
Figure 3: Spatial Profile of Economic Distortion (with emphasis on extreme values)
Table 3: Economic Distortion

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AN</td>
<td>-0.14</td>
<td>-0.23</td>
<td>-0.39</td>
<td>-0.43</td>
<td>-0.29</td>
<td>-0.40</td>
<td>-0.83</td>
<td>-0.08</td>
<td>-0.42</td>
<td>-0.52</td>
<td>-0.78</td>
</tr>
<tr>
<td>BA</td>
<td>1.43</td>
<td>1.11</td>
<td>1.25</td>
<td>1.26</td>
<td>1.20</td>
<td>1.28</td>
<td>1.43</td>
<td>1.04</td>
<td>1.25</td>
<td>1.23</td>
<td>1.34</td>
</tr>
<tr>
<td>BD</td>
<td>0.53</td>
<td>-0.69</td>
<td>0.18</td>
<td>-0.70</td>
<td>-1.10</td>
<td>-0.74</td>
<td>-1.44</td>
<td>-1.64</td>
<td>0.15</td>
<td>-0.17</td>
<td>-1.14</td>
</tr>
<tr>
<td>BN</td>
<td>1.38</td>
<td>3.67</td>
<td>2.05</td>
<td>2.67</td>
<td>3.06</td>
<td>2.52</td>
<td>4.03</td>
<td>2.27</td>
<td>3.21</td>
<td>2.70</td>
<td>3.78</td>
</tr>
<tr>
<td>BO</td>
<td>8.42</td>
<td>-1.64</td>
<td>-0.63</td>
<td>-0.72</td>
<td>-2.06</td>
<td>-1.74</td>
<td>-1.28</td>
<td>-0.58</td>
<td>10.33</td>
<td>-3.58</td>
<td>-1.01</td>
</tr>
<tr>
<td>CR</td>
<td>0.83</td>
<td>0.06</td>
<td>-0.05</td>
<td>-0.12</td>
<td>0.16</td>
<td>0.38</td>
<td>-0.34</td>
<td>-0.26</td>
<td>0.06</td>
<td>0.37</td>
<td>-0.21</td>
</tr>
<tr>
<td>GG</td>
<td>0.35</td>
<td>2.15</td>
<td>1.79</td>
<td>1.93</td>
<td>2.03</td>
<td>1.94</td>
<td>2.11</td>
<td>1.82</td>
<td>2.14</td>
<td>1.86</td>
<td>2.32</td>
</tr>
<tr>
<td>IM</td>
<td>-1.91</td>
<td>-5.20</td>
<td>-3.96</td>
<td>-5.35</td>
<td>-6.38</td>
<td>-5.14</td>
<td>-4.28</td>
<td>-6.21</td>
<td>-7.13</td>
<td>-4.85</td>
<td>5.82</td>
</tr>
<tr>
<td>KN</td>
<td>0.10</td>
<td>0.14</td>
<td>-0.01</td>
<td>-0.06</td>
<td>0.10</td>
<td>-0.06</td>
<td>0.46</td>
<td>-0.17</td>
<td>0.61</td>
<td>0.37</td>
<td>0.51</td>
</tr>
<tr>
<td>KD</td>
<td>-0.38</td>
<td>-0.24</td>
<td>-0.71</td>
<td>-0.31</td>
<td>-0.33</td>
<td>-0.34</td>
<td>-0.32</td>
<td>-0.49</td>
<td>0.05</td>
<td>0.50</td>
<td>-0.26</td>
</tr>
<tr>
<td>LG</td>
<td>-1.36</td>
<td>-0.94</td>
<td>-1.03</td>
<td>-0.91</td>
<td>-1.83</td>
<td>-0.99</td>
<td>-1.13</td>
<td>-0.94</td>
<td>-1.27</td>
<td>0.89</td>
<td>-0.78</td>
</tr>
<tr>
<td>NG</td>
<td>1.65</td>
<td>1.36</td>
<td>1.63</td>
<td>1.47</td>
<td>1.64</td>
<td>1.43</td>
<td>0.89</td>
<td>1.28</td>
<td>1.69</td>
<td>1.64</td>
<td>1.46</td>
</tr>
<tr>
<td>OG</td>
<td>-0.10</td>
<td>0.12</td>
<td>-0.67</td>
<td>-0.07</td>
<td>-0.16</td>
<td>-0.08</td>
<td>-0.35</td>
<td>-0.03</td>
<td>0.16</td>
<td>-0.04</td>
<td>-0.07</td>
</tr>
<tr>
<td>OD</td>
<td>-0.55</td>
<td>1.44</td>
<td>0.53</td>
<td>0.51</td>
<td>-0.16</td>
<td>0.57</td>
<td>0.63</td>
<td>0.37</td>
<td>0.53</td>
<td>0.60</td>
<td>0.66</td>
</tr>
<tr>
<td>OY</td>
<td>0.75</td>
<td>7.12</td>
<td>10.05</td>
<td>7.95</td>
<td>10.40</td>
<td>7.91</td>
<td>8.00</td>
<td>8.67</td>
<td>8.87</td>
<td>8.83</td>
<td>9.50</td>
</tr>
<tr>
<td>PL</td>
<td>-2.85</td>
<td>-0.38</td>
<td>-0.43</td>
<td>-0.63</td>
<td>-0.50</td>
<td>-0.59</td>
<td>-0.81</td>
<td>-0.57</td>
<td>-0.58</td>
<td>-0.46</td>
<td>-0.63</td>
</tr>
<tr>
<td>SO</td>
<td>0.41</td>
<td>1.43</td>
<td>1.12</td>
<td>1.16</td>
<td>1.30</td>
<td>1.05</td>
<td>1.51</td>
<td>0.94</td>
<td>0.87</td>
<td>1.18</td>
<td>1.45</td>
</tr>
<tr>
<td>XR</td>
<td>3.70</td>
<td>7.60</td>
<td>5.00</td>
<td>10.00</td>
<td>9.00</td>
<td>10.00</td>
<td>16.00</td>
<td>23.50</td>
<td>46.00</td>
<td>82.25</td>
<td>85.00</td>
</tr>
</tbody>
</table>

Notes: AN ≡ Anambra, BA ≡ Bauchi, BD ≡ Bendel, BN ≡ Benue, BO ≡ Borno, CR ≡ Cross River, GG ≡ Gongola, IM ≡ Imo, KD ≡ Kaduna, KN ≡ Kano, KW ≡ Kwara, LG ≡ Lagos, NG ≡ Niger, OG ≡ Ogun, OD ≡ Ondo, DY ≡ Oyo, PL ≡ Plateau, RV ≡ Rivers, SO ≡ Sokoto, XR ≡ N/S, parallel market exchange rate series for the respective years expressed in Naira per US dollar. GDP figures used in the analysis are in local currency in billions of naira. The values in the table are the ratios of the logarithm of potential real output to the logarithm of actual real output. They represent a measure of yearly deviation of actual output from what it would be if each chunk of infrastructure had been installed where it would be economically most productive in the country. The distortion can be given a political meaning in terms of winners (+) and losers (-) under the status quo (i.e., before reallocation).
4.4 Linking economic distortion and political influence

Here, we examine the extent to which economic distortion can be attributed to political influence in the arena in which public capital expenditure decisions are made. The following regression model relates the output gap to economic and political variables, plus their lagged values, $Z$, and a vector of errors, $u$:

$$Y = Z\delta + u.$$  

(9)

$Z$ is an $n \times p$ partitioned matrix of $(p - 1)$ explanatory variables. Each partition is a $T \times p$ matrix, and $\delta$ is a $p$-element column vector. This model seeks to attribute departures from an efficient distribution of infrastructure capital to the components of $Z$. The model includes economic variables as controls.

Whereas it is possible that the size of a regional GDP or the absolute population in a region might matter in political bargaining, per capita real income could matter more if some infrastructure expenditure is used for income redistribution. This point merits consideration because even a transient political pressure for redistribution can cause deviations from an economically efficient allocation path. However, a search through the fiscal history (planning and budget documents) of the Federation within 1960–95 does not indicate re-distributive capital spending of any kind. This is notwithstanding notable incidences of uprising from the oil and mineral producing areas of the Federation, as well as from other segments of the polity to redress perceived inequities in resource allocation.\footnote{The matter of re-distributive spending particularly Federation revenue-allocation formula is now receiving priority attention in the current leadership, particularly as it relates to the oil-producing regions.} In view of this realpolitik, we do not control for the effect of income inequality on the allocation of infrastructure expenditure.

Severe shocks to income can also induce pressure on the government to undertake allocations that are less than efficient. The oil boom of the 1970’s led to much indiscriminate public spending, a part of which involved dramatic increases in infrastructure expenditure without much debate, analysis or careful planning. Also, the reverse can occur when countries experience severe drop in income. In such a circumstance, feeding people are of more immediate concern so that the first programs to be put on hold are those that are long term. Since the benefits of infrastructure investments are spread over a long term, while the costs (or effects) of immediate cut backs occur with a lag, infrastructure spending cuts
are particularly expeditious for politicians attempting to maneuver tight budgetary corners. Therefore, to control for the probable lagged effect of income flow on public-capital formation, we use changes in Federal Government annual revenue.

Finally, we include a dummy variable to reflect the claimed “Northern Oligarchy” or “Arewa” power bloc. Observers of the Nigerian political scene have often said that whereas the Northern coalition invariably has a core, the Southern coalition when it exists often has a core that is empty—the Southerners in most instances are unable to sustain a compromise. The argument is that the existence of this power bloc allows the Northern States to influence a disproportionately large allocation of resources to themselves.

The model we estimate can be stated as,

\[ y_{it} = \alpha + \sum_{k=1}^{N} \delta_k z_{ikt} + \sum_{j=1}^{M} \phi_j z_{ij(t-11)} + \sum_{h=1}^{G} \gamma_h z_{ih(t-5)} + \rho R_t + \rho_1 R_{t-11} + \rho_2 R_{t-5} + \sigma D_t + \epsilon_t \]

where \( D \) takes the value 1 in any year in which a state belongs in the Northern power bloc, and the value zero, otherwise. The variables in \( z \) are Federal appointments by state of origin of the appointee and the number of years the position is occupied. The positions are listed in Table 4. Overall, there are 18 Federal positions analyzed. Furthermore, 8 out of the 18 positions were analyzed for “timing value.” This says that a priori, constituencies (regions) whose representatives hold positions during the Second and Third National Development Plan periods (1970–74, and 1975–80) ought to be at an added advantage.\(^{13}\) The years 1974 and 1980 represent the end of Plan periods and the beginning of new plans and commitments, sort of the “putty period of the clay;” before investments harden. The \( R \)'s are changes in Federal revenues. These also, are lagged to periods immediately preceding the Second and Third National Plan. The premise is that revenue flows prior to the Plan inception must have conditioned expectations about future sustainable investment magnitudes. As usual, \( i \) indexes the constituent states of the Federation while \( \epsilon_t \) is the error term.

Each equation is a classical regression. Therefore, the parameters can be estimated consistently by OLS. However, we gain efficiency by using the GLS estimation to capture contemporaneous correlation across the disturbances as well as the cross equation restrictions implicit in the model.

\(^{13}\)The Second and Third National Plan periods are most relevant to the stock of infrastructures that we analyze.
4.5 Empirical results and inferences

We report in Table 5 the parameter estimates as well as the joint and several tests of the restriction that each political position does not matter either contemporaneously or with a lag. The values of the test statistics are computed as an asymptotic chi-squared test of the linear restrictions.

Although the pattern of distortion clearly shows a regional trend, still the data do not support the often-claimed influence of the Northern Power Bloc called "AREWA." Therefore, in this instance, clout seems to attend specific positions but not to the group coalition. One more thing that should be noted before discussing other specifics of the empirical result is the possibility that political pressures may lead to differential improvement in infrastructure quality and maintenance. This is a very important dimension that was not treated explicitly in the model. The linkages examined was between the quality adjusted stock of infrastructure and political influence. The quality linkage is admittedly very weak and we think that many of the political positions that would otherwise assume prominence fail to do so as consequence. An overview of infrastructures in most sub-Saharan countries reveals problems rooted in poor operable condition of installed capacities and so influencing maintenance and quality is an equally important dimension although one that deserves a separate analysis. Mindful of this shortcoming, we present the following findings.

The Head of State, the Minister of Agriculture and Natural Resources, the Minister of Communications, and the Minister of Finance, were all found to be influential at conventional significance levels (between 5% and 1%). At the 6% significance level, the Governor of Central Bank and the Inspector General of Police (both non-ministerial members) become influential.

We can account for the inverse effect of the Central Bank Governor by appealing to the politics of budget making, according to which the budget can be viewed as the outcome of bargains between “ministries” or bureaucratic groups. The spending ministries counsel expansion while the financing group seeks restraint.\footnote{For an elaboration, see Bates and Deverajan (2000) and Ferejohn and Krebhiel (1987).} Ferejohn and Krebhiel (1987) frame budget politics as a sequential game thereby illustrating the value of timing (first-mover advantage) in terms of the resulting levels and patterns of expenditure. The current institutional set up has the spending ministries move first and the Central Bank reconciles their claims.
The Central Bank of Nigeria [CBN] initiates monetary and banking policies, sends the proposal to the government for amendment, approval, or rejection. When approved by the Federal Government, the CBN is obligated to carry out the approved policy. Before 1988, proposals were forwarded to the Federal Executive Council through the Minister of Finance for integration into the Federal Budget. Since 1988, proposals have been sent directly to the Head of State. Thus, it could be viewed that prior to 1988, the rules of the budget game embodied a simultaneous move in which the Central Bank budget was transmitted to the Ministry of Finance to be integrated into the national budget. Prior to 1988, the Central Bank was under the Federal Ministry of Finance, but since 1988 has been placed directly under the Presidency, with the Governor reporting directly to the Head of State.

On the other hand the influence of the Inspector General of Police can derive from other members of the cohort attaching importance to the issues under his purview. It is probable that as the era examined was marked by intense corruption, law enforcement officers could acquire clout by leveraging the discretion that attends to their prosecutorial powers. And generally as suggested in Ferejohn (1974), some bureaucrats are “more influential than others simply because the issues they deal with are more important (perhaps to other members of the cohort).”

It may be useful to note the following additional background information gathered from field interviews of retired bureaucrats and from some relevant officials still in active service: In cases of infrastructure types involving less bargaining over public rights, there tended to be visibly more influence peddling over the distributional process. Examples are water supply facilities that end up either in the backyards or on the farms of officials, as boreholes or irrigation schemes. Yet other infrastructures such as digital telecommunication exchanges are constructed in (uneconomically) remote villages to furnish access to the rural home of influential officials.

In considering for instance, investments in new digital exchanges across the country, a

---

15 In a democratic regime, the Federal Executive Council comprises Federal ministers and state governors, but in a military regime, the composition is ad hoc.
16 Such personalization of public resources are much more difficult to organize in respect of highways or power-transmission infrastructure. For instance, to negotiate private benefits in roads construction requires a multitude of parties over whose territories you have to secure rights of way before connecting a roadway from Point A to Point B of interest. Similarly for power-transmission infrastructures that may require several kilometers of dangerous high-tension lines over dispersed territorial rights.
case in point would be the Langtang Digital Exchange in Plateau State. Establishment of the exchange was motivated by political reasons. Its installation was as a result of a directive by President Babangida as a form of compensation to Lieutenant General Domkat Bali (his Defense Chief) who he retired from the Armed Forces in 1992. Although considered a poor prioritization in its investment schedule by NITEL, it was nonetheless the first digital exchange in the North. The prominent role of other top military officers in Plateau apparently led to the establishment of other digital exchanges at Shendam and Pankshin. These digital exchanges were established before the Jos metropolitan exchange which now cross subsidizes the Langtang, Shendam and Pankshin facilities.

The same story holds for the mobile telephone company M-Tel that faced problems of political manipulation of its infrastructure investment decisions. For example, in its Areas II and III service points, it was made to cover areas such as Benue and Niger States when the viability of these projects is doubtful. These projects were largely influenced by the then incumbent, President Babangida from Niger State and Communications Minister, Lieutenant Colonel David Mark from Benue State.

Here are other ways by which “business gets done:” Influential staffers within line ministries are able to include their projects into the Plan. Invariably approved Plans are for less than budgeted. The case is then made that due to short falls, ministries are forced to select from the menu of projects. So, the selector—the agenda setter—thereby acquires a strong influence.

Another avenue is through Extra-Budgetary and Special Project’s funding. In principle, extra-budgetary allocations augment projects that are already in the Plan but risk abandonment due to short funding. In practice, they come as tied aid, with other pet projects “piggy-backing” on it. Essentially, the overriding goal for the funding become these tacked-on projects so that the receiving Ministry merely provides a formal legitimacy within which the piggy-backed projects (the real objects of interest) get implemented, sometimes serving as a prelude to full membership into a formal expenditure group. Membership of a formal expenditure group assures continuity of funding or at least consideration for it. Roads provide an example of this process. Conversion to dual carriageways (dualization), or highway upgrades are in principle, selected on the basis of traffic count. However, special projects and extra-budgetary expenditure can direct that a feeder or rural road be dualized or upgraded. And soon after, that same road now only a short step away, is marked for adoption
as a “Trunk A” (that is, a major federal highway).

5 Summary and concluding remarks

Grounded in empirical realities, this study has demonstrated the pervasive influence of distributional politics in the Federation of Nigeria. It validates what Joseph (1987) labeled *prebendal* Nigeria, a term that is meant to capture the “intensive and persistent struggle to control and exploit the offices of the state.” Here it seems that one group have successfully employed the power of the state to overwhelmingly direct resources to itself.

The ascendancy of the center state followed an early intervention of the military in the history of Nigerian politics. Also contributing were, the vast increase in, and the concentration of oil wealth in the center state, as well as the commitment after the Nigerian civil to a state-directed economic development—reconciliation, rehabilitation, and reconstruction. These laudable objectives were project-based policies and may have provided just the right means and opportunity to disproportionately redirect resources to the North.

We had earlier acknowledged that economic decisions cannot always and everywhere be the overriding criteria and it need not be. However, given the pervasiveness of poverty in Nigeria, it seems that such persistent inefficiency in resource allocation is not only troubling for the significant welfare losses that it entails, but more for the danger of generating social conflict over time.

The Government has begun to tackle the disparity. However, it seems that the only lasting way to ameliorate the impact of politics on public capital expenditure is through a careful attention to the composition of interest groups or political parties. A consociational structure of interest groups appears to promote restraint in the competition for benefits in the public domain. But in the current wave of decentralization, it is not clear how this competing claim will be reconciled unless the delivery of infrastructure services are transferred to the private sector. Unless infrastructure privatization is pursued vigorously, inefficiencies will persist. It will persist because of the logic of collective action, for whereas the benefits of regional allocation are concentrated, the losses are distributed nationwide even though in the aggregate, there is a net loss.
Table 4: Federal Political Appointments Analyzed

<table>
<thead>
<tr>
<th>Serial</th>
<th>Position (z)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Head of State</td>
</tr>
<tr>
<td>2</td>
<td>Chief of General Staff</td>
</tr>
<tr>
<td>3</td>
<td>Chief of Defense Staff</td>
</tr>
<tr>
<td>4</td>
<td>Chief of Army Staff</td>
</tr>
<tr>
<td>5</td>
<td>Chief of Air Staff</td>
</tr>
<tr>
<td>6</td>
<td>Chief of Naval Staff</td>
</tr>
<tr>
<td>7</td>
<td>Secretary to the Federal Government</td>
</tr>
<tr>
<td>8</td>
<td>Managing Director/Chief Executive NEPA</td>
</tr>
<tr>
<td>9</td>
<td>Governor of Central Bank</td>
</tr>
<tr>
<td>10</td>
<td>Inspector General of Police</td>
</tr>
<tr>
<td>11</td>
<td>Minister for Economic Development</td>
</tr>
<tr>
<td>12</td>
<td>Minister of Agriculture and Natural Resources</td>
</tr>
<tr>
<td>13</td>
<td>Minister for Trade and Industry</td>
</tr>
<tr>
<td>14</td>
<td>Minister of Communications</td>
</tr>
<tr>
<td>15</td>
<td>Minister of Finance</td>
</tr>
<tr>
<td>16</td>
<td>Minister of Foreign Affairs</td>
</tr>
<tr>
<td>17</td>
<td>Minister of Mines, Power and Steel</td>
</tr>
<tr>
<td>18</td>
<td>Minister of Works and Housing</td>
</tr>
</tbody>
</table>

Note: NEPA is National Electric Power Authority

Table 5: Estimates of Political Influence

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Estimate</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of State</td>
<td>2.39336</td>
<td>* .015</td>
</tr>
<tr>
<td>Chief of General Staff</td>
<td>-0.73364</td>
<td>.276</td>
</tr>
<tr>
<td>Chief of Defense Staff</td>
<td>-0.42824</td>
<td>.726</td>
</tr>
<tr>
<td>Chief of Army Staff</td>
<td>-0.12757</td>
<td>.912</td>
</tr>
<tr>
<td>Chief of Air Staff</td>
<td>0.41059</td>
<td>.621</td>
</tr>
<tr>
<td>Chief of Naval Staff</td>
<td>-0.96362</td>
<td>.274</td>
</tr>
<tr>
<td>Secretary to the Federal Government</td>
<td>0.23166</td>
<td>.778</td>
</tr>
<tr>
<td>Managing Director/Chief Executive NEPA</td>
<td>0.73631</td>
<td>.543</td>
</tr>
<tr>
<td>Governor of Central Bank</td>
<td>-2.89759</td>
<td>.055</td>
</tr>
<tr>
<td>Inspector General of Police</td>
<td>-1.89519</td>
<td>.055</td>
</tr>
<tr>
<td>Minister for Economic Development</td>
<td>3.21508</td>
<td>* .019</td>
</tr>
<tr>
<td>Minister of Agriculture and Natural Resources</td>
<td>-2.28541</td>
<td>.699</td>
</tr>
<tr>
<td>Minister for Trade and Industry</td>
<td>1.30192</td>
<td>.123</td>
</tr>
<tr>
<td>Minister of Communications</td>
<td>4.84876</td>
<td>** .001</td>
</tr>
<tr>
<td>Minister of Finance</td>
<td>-2.18711</td>
<td>* .013</td>
</tr>
<tr>
<td>Minister of Foreign Affairs</td>
<td>-1.22650</td>
<td>.233</td>
</tr>
<tr>
<td>Minister of Mines, Power and Steel</td>
<td>0.51902</td>
<td>.728</td>
</tr>
<tr>
<td>Minister of Works and Housing</td>
<td>-0.58228</td>
<td>.526</td>
</tr>
</tbody>
</table>

Wald Test for the Hypothesis that the parameters are jointly zero:
\( \chi^{(42)} = 60.2709; \text{P-value} = 0.03351 \)

Notes: The equation estimated is 
\( y_t = \alpha + \sum_{k=1}^{N_1} \delta_k z_{ikt} + \sum_{j=1}^{M_1} \phi_j z_{ij(t-11)} + \sum_{n=1}^{G_1} \gamma_n z_{in(t-5)} + \rho_1 R_t + \rho_2 R_{t-5} + \sigma D_t + \epsilon_t \). Standard Errors are computed from heteroscedastic-consistent matrix, and also are robust to autocorrelation (assuming first order serial correlation). * denotes significance at the 5% level; ** at the 1% level.
Table 6: Estimates of the Effect of Being in Position, Year 1974

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Estimate</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of State</td>
<td>1.76171</td>
<td>.162</td>
</tr>
<tr>
<td>Chief of General Staff</td>
<td>-0.84501</td>
<td>.416</td>
</tr>
<tr>
<td>Managing Director/Chief Executive of NEPA</td>
<td>0.177338</td>
<td>.885</td>
</tr>
<tr>
<td>Minister for Economic Development</td>
<td>-2.15291</td>
<td>.108</td>
</tr>
<tr>
<td>Minister of Communications</td>
<td>0.757336</td>
<td>.397</td>
</tr>
<tr>
<td>Minister of Finance</td>
<td>-1.37711</td>
<td>.461</td>
</tr>
<tr>
<td>Minister of Mines, Power and Steel</td>
<td>1.35356</td>
<td>.215</td>
</tr>
<tr>
<td>Minister of Works and Housing</td>
<td>-0.771840</td>
<td>.330</td>
</tr>
</tbody>
</table>

Notes: The equation estimated is \( y_{it} = \alpha + \sum_{k=1}^{N} \delta_{k} z_{ikt} + \sum_{j=1}^{M} \phi_{j} \tilde{z}_{ij(t-11)} + \sum_{h=1}^{G} \gamma_{h} \tilde{z}_{ih(t-5)} + \rho_{1} R_{t-11} + \rho_{2} R_{t-5} + \sigma_{t} + \epsilon_{t} \). Standard Errors are computed from heteroscedastic-consistent matrix, and also are robust to autocorrelation (assuming first order serial correlation).

Table 7: Estimates of the Effect of Being in Position, Year 1980

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Estimate</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of State</td>
<td>1.63622</td>
<td>.086</td>
</tr>
<tr>
<td>Chief of General Staff</td>
<td>-0.429436</td>
<td>.749</td>
</tr>
<tr>
<td>Managing Director/Chief Executive</td>
<td>1.88770</td>
<td>.108</td>
</tr>
<tr>
<td>Minister for Economic Development</td>
<td>0.768133</td>
<td>.282</td>
</tr>
<tr>
<td>Minister of Communications</td>
<td>2.73558</td>
<td>**.007</td>
</tr>
<tr>
<td>Minister of Finance</td>
<td>-0.033656</td>
<td>.977</td>
</tr>
<tr>
<td>Minister of Mines, Power and Steel</td>
<td>-0.234692</td>
<td>.744</td>
</tr>
<tr>
<td>Minister of Works and Housing</td>
<td>-0.163350</td>
<td>.852</td>
</tr>
</tbody>
</table>

Notes: The equation estimated is \( y_{it} = \alpha + \sum_{k=1}^{N} \delta_{k} z_{ikt} + \sum_{j=1}^{M} \phi_{j} \tilde{z}_{ij(t-11)} + \sum_{h=1}^{G} \gamma_{h} \tilde{z}_{ih(t-5)} + \rho_{1} R_{t-11} + \rho_{2} R_{t-5} + \sigma_{t} + \epsilon_{t} \). Standard Errors are computed from heteroscedastic-consistent matrix, and also are robust to autocorrelation (assuming first order serial correlation). ** denoted significance at the 1% level.

Table 8: Estimates of the Control Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contemporaneous Revenue</td>
<td>-0.275170E-05</td>
<td>.593</td>
</tr>
<tr>
<td>Revenue in 1974</td>
<td>-0.112795E-04</td>
<td>.916</td>
</tr>
<tr>
<td>Revenue in 1980</td>
<td>0.129655E-04</td>
<td>.762</td>
</tr>
<tr>
<td>AREWA coalition</td>
<td>-1.12583</td>
<td>.158</td>
</tr>
</tbody>
</table>

Notes: The equation estimated is \( y_{it} = \alpha + \sum_{k=1}^{N} \delta_{k} z_{ikt} + \sum_{j=1}^{M} \phi_{j} \tilde{z}_{ij(t-11)} + \sum_{h=1}^{G} \gamma_{h} \tilde{z}_{ih(t-5)} + \rho_{1} R_{t-11} + \rho_{2} R_{t-5} + \sigma_{t} + \epsilon_{t} \). Standard Errors are computed from heteroscedastic-consistent matrix, and also are robust to autocorrelation (assuming first order serial correlation).
6 References


World Currency Yearbook 1986–87 ‘Nigeria Naira: Currency Developments’
Emphasizing Extreme Values (Economic Distortion)