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White elephants☆

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Abstract

Underdevelopment is thought to be about lack of investment, and many political economy theories can account for this. Yet, there has been much investment in developing countries. The problem has been that investment growth has not led to output growth. We therefore need to explain not simply underinvestment, but also the missallocation of investment. The canonical example of this is the construction of *white elephants*—investment projects with negative social surplus. In this paper we propose a theory of white elephants. We argue that they are a particular type of inefficient redistribution, which are politically attractive when politicians find it difficult to make credible promises to supporters. We show that it is the very inefficiency of such projects that makes them politically appealing. This is so because it allows only some politicians to credibly promise to build them and thus enter into credible redistribution. The fact that not all politicians can credibly undertake such projects gives those who can a strategic advantage. Socially efficient projects do not have this feature since all politicians can commit to build them and they thus have a symmetric effect on political outcomes. We show that white elephants may be preferred to socially efficient projects if the political benefits are large compared to the surplus generated by efficient projects.
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1. Introduction

Developing countries seems to be plagued by extreme resource misallocation. Evidence of this comes from both econometric work showing large gaps in total factor productivity between rich and poor countries (Hall and Jones, 1999), and from numerous case studies of rent seeking, the rise of the informal sector and inefficient parastatals. Many of these distortions seem to be created by politicians and the state. Following Bates (1981) most scholars have seen such outcomes as politically rational, even while they are socially disastrous. For example, the most likely explanation of the types of restrictions on entry analyzed by de Soto (1989) and Djankov et al. (2002) is that they generate rents which can be redistributed to generate political support.

However, many aspects of politically induced resource allocation remain puzzling. For instance, there are now many political economy models which can explain under-investment[1]. Nevertheless, developing countries seem to be plagued not simply by underinvestment, but by investment in the wrong things.

Nothing is as depressing in a developing economy as the presence of *white elephants*. We define a white elephant to be a project with a negative social surplus. Some classic examples come from the activities of INDECO, the Industrial Development Corporation of Zambia. Documenting the failure of this institution to promote development Tangri (1999), p. 30 argues that this was because

> INDECO was subject to a series of ad hoc political directives on specific operational issues, including type and location of investments. Projects were undertaken on political considerations although, as in the case of Mansa batteries, the feasibility study concluded that the project based in Mansa would be uneconomic. Moreover, projects such as the Chinese maize mill at Chingola were started without any feasibility study being undertaken; the decision was a purely political one, which led to the already planned and evaluated maize mill in Kitwe being abandoned. Directives were also issued regarding the location of projects. The locations of the Livingstone Motor Assemblers, Kapiri Glass Products and Mansa Batteries, all subsidiaries of INDECO, were decided on the basis of providing employment outside the main urban areas. These and similar projects ran into difficulties for various reasons, partly because, being located in up-country centres, they were situated a long way from the main markets. Multi-million dollar brick factories were set up under official directive in the rural areas at Kalalushi and Nega Nega, but transporting the bricks long distances to the construction sites raised their costs to uneconomic levels, with the result that the construction industry switched to the use of concrete blocks. Because of the declining demand for its products, the brick works at Nega Nega was forced to close down in 1979 and the factory at Kalalushi incurred large losses.

[1] This may be because politicians discount the future too much, because of redistributive taxation (Alesina and Rodrik, 1994; Persson and Tabellini, 1994a), or because of the impact of investment on the future political equilibrium (Besley and Coate, 1998; Acemoglu and Robinson, 2002).

Tangri's discussion of Zambian industrial policy suggests not only are white elephants built, but they are built when they are understood to be white elephants and, even worse, they crowd out socially desirable projects. Thus it is not just that politicians are bad at picking winners, they actually pick known losers.

One of the most detailed studies of white elephants is Killick's book (1978) about development in Ghana. He discusses in great detail examples of how cost benefit calculations were ignored and inefficient investment projects undertaken. One example was a cattle-based industrial complex (Killick, 1978, p. 231).

> The footwear factory...would have linked the Meat factory in the North through transportation of the hides to the South (for a distance of over 500 miles) to a tannery (now abandoned); the leather was to have been backhauled to the Footwear factory in Kumasi, in the center of the country and about 200 miles north of the tannery. Since the major footwear market is in the Accra metropolitan area, the shoes would then have to be transported an additional 200 miles back to the South.

Killick somewhat understatedly remarks (p. 231) that this was an enterprise "whose viability was undermined by poor siting". As in Zambia, the motivation behind decisions to misallocate resources was clearly political. Rimmer (1969), p. 195, argues that "Projects were begun without feasibility studies and without competitive tendering. New enterprises were distributed among party functionaries as private fiefs, enabling them to give patronage to relatives, friends, and supporters," and Omaboe (1966), pp. 460–461, concludes "In Ghana the politicians are always ahead of the civil servants and planners in the general consideration and implementation of economic and social projects".[2]

There are many more well documented instances where the location of public investment projects has been determined by political not economic factors. Bates (1981), pp. 24–25, 114–115 discusses many, concluding "governments are often willing

[2] The Ghanaian case illustrates a key motivation of this paper. The problem under Nkrumah was not underinvestment. Indeed, the consensus view is that the capital stock increased by 80% between 1960 and 1965 (Killick, 1978, p.69), 60% of which being by the public sector (80% of non-residential investment, Killick, 1978, p. 170). The problem was in the way this investment was allocated. Another class of white elephants comes from oil exporters. Following the Arab embargo of October 1973 the sharp increase in oil prices produced large income gains to oil exporters. The bulk of the oil rents were invested in public projects but with no growth payoff (for OPEC as a whole GDP per capita on average decreased by 1.3% each year from 1965 to 1998, see Gylfason, 2001) So that it becomes: (2001). In Nigeria, between 1973 and 1976 capital expenditure rose by a factor of more than nine (see Gavin, 1993) and Gelb (1988), p. 241 finds that "public capital spending accelerated rapidly from only 3.6% of non-mining GDP in 1970 to 29.5% by 1976. This acceleration was so strong that it alone absorbed *more* than the entire increase in oil income between 1970 and 1976". Gelb (1988) finds that overall about half of the oil rents earned in the six oil exporting countries he studies were invested domestically. He finds a very disappointing growth performance among the countries. For instance (p. 122): "An outstanding case is Venezuela, which simply stopped growing in 1979 despite the largest investment program in its history". Later researchers of the resource curse such as Sachs and Warner (1995), Gylfason (2001) and Auty (2001) have confirmed the weak growth performance of oil exporters. Gavin (1993), p. 216 echoes the consensus explanation when he notes "the tendency for governments to invest in projects with high prestige or political payoff, but with little economic rationale".

to lower the profits of firms in order to secure other objectives—such as plant location that is politically desirable though economically disadvantageous". In their explanation of the catastrophic growth experience of Burundi, Nkurunziza and Ngaruko (2002), p. 1 motivate their political economy approach by arguing that "when priority is given to investment projects as a function of their location rather than the objective need of the economy, the economic model loses its explanatory power". The case study evidence shows that the location of public projects is determined by the desire of politicians to redistribute to their own geographically based groups. In Burundi by the early 1970s the government was controlled by a faction of Tutsi's from Bururi province. Nkurunziza and Ngaruko (2002), pp. 19–23 document that as a consequence huge amounts of resources were targetted at Bururi including schools, roads, and public sector investments. For instance, even though Tutsi's represented only about 14% of the population, 60% of the managers of public corporations were Bururi Tutsis.

Nkurunziza and Ngaruko also show how state owned companies continued to be funded for long periods even if they made huge losses. In the period 1977–1982 about 100 state owned companies were created. The main motive was to transfer rents to political supporters. Although (p. 24) "most of the corporations experienced cash flow problems accommodated with massive injections of subsidies" they continued to receive financing and by 1990 "state firms accounted for 31% of formal sector employment, 25% of outstanding domestic credit, and benefited from 3.4% of GDP in financial flows from the government". The public financing continued even longer and "By 1995, equity capital for 36 such firms with majority state participation represented 20% of the country's GDP, but overall, these corporations posted a net loss equivalent to 6% of GDP or 14% of government revenue".[3]

The political nature of the creation and location of white elephants suggests that when political power changes, old investment projects ought to be terminated and new ones begun. In general terms this is the message of Barkan and Chege (1989). They divide the provinces of Kenya into the Kenyatta political base and the Moi political base, each containing 33% of the population. While expenditures on road construction under Kenyatta grossly favored the Kenyatta provinces, when Moi came to power expenditures shifted away from Kenyatta toward Moi provinces. Within 1 year the share going to the Kenyatta base decreased from 44% to 28% of the total, while the share going to the Moi base increased from 32% to 38% of the total. In 1986, 6 years after, the Kenytta base received 16% of the total, while the Moi base received 67%. More specifically, in the context of public investment projects, Keefer (2002), p. 27 reports that "one high official in the ruling government of President Hipolito Mejía of the Dominican Republic claimed that hundreds of projects that were begun by the government of Joaquin Balaguer, two governments before, were then paralyzed under the Leonel Fernández government. Other observers noted that incomplete projects from the Fernández government were similarly halted under Mejía".

[3] The implications of such resource missallocation emerge when the authors estimate the behavior of TFP in Burundi (p. 8). Though GDP per-capita fell by 40% between 1960 and 1997, the capital labor ratio increased 58 times! In consequence, TFP in 1997 was 4% of its 1960 level.

The journalistic literature treats white elephants as the worst symptoms of the megalomania of rulers. Yet, a more plausible explanation is that they constitute some form of inefficient redistribution. They are basically an instrument used to raise the income of a particular constituency. Yet why raise incomes in such an inefficient way? The existing literature does not well account for this. For example, the theory of Coate and Morris (1995) rests on the postulate that a white elephant must be believed to be socially efficient with a sufficiently high probability if it is to be built. This does not seem plausible in this context. Similarly, the theory of Lizzeri and Persico (2001) suggests that white elephants might be desirable because they can be targeted at supporters. While this may be true, their theory cannot explain why one would want to target supporters by building a project with negative social value added.

In this paper we build a theory of the construction of white elephants. Most importantly, we show that it is the very inefficiency of such projects that makes them politically appealing. This is so because it allows only some politicians to credibly promise to build them and thus enter into credible redistribution. The fact that not all politicians can credibly undertake such projects gives those who can a strategic advantage. Socially efficient projects do not have this feature since all politicians can commit to build them and they thus have a symmetric effect on political outcomes.

Our theory builds on several key ideas, that white elephants are; (1) part of an exchange relationship between politicians and voters (a situation which political scientists call 'clientelism') where there are important advantages of incumbency[4], that (2) politicians face commitment problems in offering policy favors in exchange for votes (Alesina, 1988; Besley and Coate, 1997; Dixit, 1997), and (3) this commitment problem may lead to inefficient forms of redistribution being chosen. As is evident from the above examples, the informal literature, though it does not explain why white elephants occur, certainly connects them to clientelistic policies. Also, the political science literature on clientelism is consistent with our emphasis on commitment since the informal, semi-legal character of the relation is recognized (Eisenstadt and Roniger, 1984, pp. 48–49, for example argue that this is one of the four key elements of clientelism). This implies that patrons "cannot be sure that the 'clientelistic deal' will be honored, as no legal enforcement mechanism can be devised" Piattoni (2001), p. 7.

Our model features two groups each of whom is imperfectly represented by a politician. In contrast to most political economy models we do not assume that politicians are either purely *opportunistic* or purely *partisan*, to employ the terminology in Persson and Tabellini (2000), where *partisan* refers to a situation where (p. 10) "politicians care about the well-being of particular groups in society". We agree with Persson and Tabellini (p. 11) that "politicians may be opportunistic but also motivated by a particular ideological view of the world." We capture this by assuming that politicians maximize a weighted sum of their own welfare and the welfare of the group they represent, but where their own

[4] Weingrod (1977), p. 42 argues that "Patrons are powerful since they can tap and distribute tangibles—government contracts, jobs loans and the like—and it is through the shrewd investment of these resources that they build and maintain their personal clientele".

welfare is most important.[5] We assume that citizens within each group have heterogeneous political preferences and thus may vote for either politician—a politician representing a group cannot be certain of gaining the votes of members of his group. There are two periods with an election occurring at the end of the first period. One of the politicians is an incumbent who can initially decide on the levels of lump-sum taxes and transfers and how much and what sort of public sector investment to undertake. There are two sorts of projects, one which raises the incomes in the incumbent's region and one which raises the incomes in the other region, and both types of project may be either socially efficient or white elephants. Investment projects undertaken initially can be operated or not after the election. In addition both politicians can make promises of taxes and transfers in order to win the election.

Consider first the incentives of politicians to tax and transfer. Since politicians always value their own consumption higher than that of others, there is never an incentive to make transfers unless this can influence the outcome of the election. However, since we assume that there is no commitment, it is not credible for politicians to offer any transfers at all, or promise a reduced tax burden. The situation with investment projects for the incumbent is different. He can build projects favoring his clients, or the clients of the challenger. These projects can be efficient or inefficient. Consider the political cost benefit calculation of an efficient project, which raises the income in the incumbent's region. This can be initiated before the election and operated afterwards if the incumbent wins and has the benefit of generating positive revenues that the incumbent values. However, these revenues are also valued by the challenging politician who will thus also find it attractive to operate the project should he win the election. The fact that an efficient project will be operated by all politicians implies that it does not increase the incentive of individuals to support the incumbent.

Consider then a white elephant. We demonstrate that such projects can be built by the incumbent because they favor members of his own group and they will be operated by the incumbent but not by the competing politician. They therefore generate large incentives to vote for the incumbent. We show not only that white elephants can be rational to build but that they can even be preferred to efficient projects. An incumbent trades off the electoral benefits from white elephants against the expected revenues that would arise from an efficient project.

Our paper is most closely related to Robinson and Verdier (2002) who argue that public sector employment is a credible way of transferring rents to political supporters, and to Keefer (2002) who study how clientelism may result from repeated face-to-face exchanges between patrons and clients. Our focus on commitment problems in a principal agent setting is similar to the notion of transaction-cost policies in Dixit (1997), and in particular to the endogenous creation of special interests; Dixit (2003), p. 112. Inefficient spending in our model does not result from a common pool problem as in, e.g. Persson and Tabellini (1994b), since in our model the decision maker faces the full costs of his own spending. Finally, our model is closely related to models where the incumbent chooses policy to bind

[5] In that sense the objective function of a politician is similar to for example Helpman (1997) where a wheighted sum of campaign contributions and welfare is maximized.

the hands of his successor, as in the models of public debt by Alesina and Tabellini (1990) and Persson and Svensson (1989). As in these papers we study a dynamic model with partisan politicians but an important difference is that in our model the incumbent chooses policy to tie his own rather than his successors' hands.

2. A simple model

Our model is based on a simple version of probabilistic voting. We consider a society with two regional parties or politicians, labeled A, B. There are two groups of voters also labeled A, B. Voters with the same label as a politician belong to that politicians' region (party, clan, ethnic group, etc.). Each politician cares about own utility and about the political outcome for agents in his region. The total mass of voters is normalized to unity, and each group A, B is of equal size $\frac{1}{2}$.[6] The per period utility U_t^i of politician $i = A$, B is given by

$$U_t^i = X_t^i + \frac{1}{2}\alpha Y_t^i, \tag{1}$$

for $t = 1$, 2. Here X_t^i denotes the income of politician i in period t, Y_t^i income of each member in group i ($\frac{1}{2}$ being the number of members in group i), and α how the outcome for his own group is valued. We assume that a politician cares more about own income than the income of others in his group so $\alpha < 1$. The incumbent politician chooses policy before the election and the politician who receives most of the votes chooses policy after the election.

Per period income Y_t^i for each voter in group $i = A$, B is given by

$$Y_t^i = W_t^i + \pi_t^i + T_t^i. \tag{2}$$

Here W_t^i denotes wage income for each agent in group i, π_t^i profit income for each agent in group i, and T_t^i net transfers (direct transfers less taxes) to each agent in group i. Agents are endowed with one unit of labor that they supply in the market. The wage in location i is equal to marginal productivity and all agents of type i receive an equal share of the profits in region i. Agents can hide all income from taxation in the informal sector at a cost which we set to zero as this will not affect any of the mechanisms in the model.

There are two public projects (factories, parastatals etc.) that are labeled project A and B, respectively. In the first period the incumbent decides on whether to invest in the projects. In case he invest in project i this requires a fraction γ of the voters in region i as employees in the first period. The investment cost is thus $\frac{1}{2}\gamma W_1^i$ (while the cost for society is the decrease in production because of diminished private employment, see below). If the investment is undertaken in the first period, the project can be operated in the second

[6] None of the mechanisms in the model depends on the regions being of equal size. However, it can easily be verified that when one region is larger than the other, the politician belonging to the largest group will have the most to gain by launching white elephants. The reason is that he will be able to tilt the reelection probability by more than the other politician.

period, while if the investment is not undertaken in the first period, the project cannot be operated in the second period. Given that the investment is undertaken, the politician in power in the second period decides whether or not to operate the project in that period. In case he operates the project he maintains the workforce from the first period, while he fires them if the project is not operated. The second period gross income of a project is S, and second period profits from project i is thus given by $P^i = S - \frac{1}{2}\gamma W_2^i$. Note that second period profits P^i does not include the sunk cost investment.

Denoting L^i the number of private sector employees in region i (dropping time subscripts), the wage in location i is equal to marginal productivity given by $b - cL^i$. The equilibrium wage without investment is $W^i = b - \frac{1}{2}c$ which we assume is positive; $\frac{b}{c} > \frac{1}{2}$. If a public investment is made in the first period (or a project is operated in the second period) the wage income in that region increases while the private profit income decreases. The equilibrium wage with investment in (or operation of) a public project is $W^i = b - \frac{1}{2}(1-\gamma)c$, while the total increase in private income in such a region is $\frac{1}{8}c\gamma^2$, or in per capita terms $\frac{1}{4}c\gamma^2$.[7]

The incumbent, which we from now allow to be politician A, initially faces the problem of choosing net transfers, and whether to launch public investment projects. He also makes promises of second period net transfers in order to win the election, and if re-elected decides whether to operate already invested projects. Rents in terms of income from being in office equal R in each period, while he receives no rents if not in office. Letting Π denote the reelection probability (yet to be determined), and letting F^i be a variable that takes value $\frac{\nu 1}{2}\gamma W^i$ if the incumbent decides to invest in project i and zero otherwise, the incumbent faces the problem of

$$\max_{T_1^i, T_2^i, P^i, F^i} \begin{bmatrix} R + \sum_i \left(-T_1^i - F^i\right) + \alpha \dfrac{1}{2} Y_1^A \\ +\Pi\left[R + \sum_i \left(P^i - T_2^i\right)\right] + \alpha \dfrac{1}{2} Y_2^A \end{bmatrix}, \qquad i = A, B \tag{3}$$

subject to (2) and the labor market equilibrium conditions. Politician B announces a policy, which he promises to implement in case he wins the election.

Voters in the two groups have the same preferences. Post election income may depend on who wins the election. D^j denotes the difference in post election income for agent j if politician A instead of politician B wins the election. Each voter j has an ideological bias σ^j toward the incumbent politician A and there is also an aggregate preference shock θ. Voter j supports the incumbent if

$$D^j + \sigma^j + \theta > 0 \tag{4}$$

[7] We choose linear marginal productivity to yield simple solutions. The result that the net increase in income for agents in a region with a public investment project is positive is independent of this, see our working paper version Robinson and Torvik (2002). In cases where results or mechanisms depend on the marginal productivity of labor being linear, we comment on that. Also, we assume no migration between regions. In Robinson and Torvik (2002) we show the minimum value the cost of migration must take for this assumption to hold in a model with costly migration.

Alternatively

$$\sigma^j > -\theta - D^j. \tag{5}$$

We assume that σ^j is uniformly distributed on the interval $\left[-\frac{1}{2s}, \frac{1}{2s}\right]$ with density $s>0$, and that θ is uniformly distributed at the interval $\left[-\frac{1}{2h}, \frac{1}{2h}\right]$ with density $h>0$.

2.1. Policies

Voters realize that for policies to be implemented they have to be ex-post optimal for the elected politician. Politicians cannot credibly commit to policies which are not in their own interest. To solve the model we thus apply backward induction. The politician who wins the election decides net transfers and whether to operate eventual public projects.

As the chosen politician values own income higher than the income of others, he will impose the revenue maximizing tax rate (which we have set to zero) on all agents and he will give no direct income transfers, $T_2^i = 0$, $i = A, B$. Promises of taxes or income transfers different from zero are not credible to any group, and the voters realize this.

It follows from the above that the operation of either public project gives the politician in power in the second period the same profit, thus $P^A = P^B = P$. First consider project A in the second period. If invested before the election politician A operates the project in case he wins the election if his net gain in utility by doing so, $P + \alpha\frac{1}{8}c\gamma^2$ is positive. He thus operates the project if

$$P \geq -\alpha\frac{1}{8}c\gamma^2 \tag{6}$$

Politician B operates project A if

$$P \geq 0. \tag{7}$$

Similarly, politician A operates project B if $P \geq 0$, and politician B operates project B if $P \geq -\alpha\frac{1}{8}c\gamma^2$. Before the election the incumbent A optimally sets taxes and transfers equal to zero, and decides whether or not to invest in the projects.

It is useful to distinguish between two types of projects:

- The ex-post profit making projects; $P \geq 0$.
- The ex-post loss making projects; $P < 0$.

Note that among the ex-post profit making projects there are also projects that are loss making when viewed from the first period as the investment cost is sunk in the second period. Ex-post profit and loss making thus refer to whether the projects can cover the variable costs if operated. Note furthermore that an ex-post loss making project is always inefficient from the point of view of society. The cost of the project is the decrease in production because of decreased private employment in each period, which totals $\gamma\left(b - \frac{1}{2}c + \frac{1}{4}c\gamma\right)$ for the two periods. The benefit of the project

is $S = P + \frac{1}{2}\gamma W^A = P + \frac{1}{2}\gamma\left(b - \frac{1}{2}(1-\gamma)c\right)$. The gain from the project from the view of the society is thus $P - \frac{1}{2}\gamma\left(b - \frac{1}{2}c\right)$ which is clearly negative when $P<0$.[8]

Consider first project A in case this is ex-post profit making. It follows from Eqs. (6) and (7) that both politicians will operate the project in the second period if the investment in the first period has been made. When the project is ex-post profit making post-election income for agents is independent of which politician that wins the election. This leads to the following proposition:

Proposition 1. *When project A is ex-post profit making*, (*i*) *it can never be used to affect the election outcome and* (*ii*) *it is launched and operated if* $P > b\gamma - \frac{1}{2}c\gamma\left(1 - \gamma\left(1 - \frac{\alpha}{2}\right)\right)$, *i.e. if it is sufficiently efficient*.

Proof 1. Post-election income of all agents is independent of the election outcome both in the case where the investment in the project is undertaken before the election and in the case where it is not undertaken, i.e. $D^j = 0$ for all agents. By standard techniques the share of voters that vote for the incumbent from group A is given by $\frac{1}{2} + s\theta$ so that the number of group A voters that supports A, N_A, is given by

$$N_A = \frac{1}{2}\left(\frac{1}{2} + s\theta\right). \tag{8}$$

The number of group B voters that support politician A is given by

$$N_B = \frac{1}{2}\left(\frac{1}{2} + s\theta\right). \tag{9}$$

The probability that the incumbent wins the election, $\Pi = \Pr\left\{N_A + N_B \geq \frac{1}{2}\right\}$, is then found as $\frac{1}{2}$, which proves part (i).

As the probability of re-election is $\frac{1}{2}$ whether the investment is undertaken or not, politician A compares the expected utility of the project with the expected cost. In case the investment is undertaken he gets the profit P with probability $\frac{1}{2}$ and agents A get an increase in income $\frac{1}{8}c\gamma^2$ with probability unity, which the politician values at α. The investment cost is $\frac{1}{2}\gamma\left(b - \frac{1}{2}(1-\gamma)c\right)$. The condition in the proposition then follows. □

Note that by the investment rule an ex-post profit making project with a positive social return may not be undertaken. The gain for the society from a project is $P - \frac{1}{2}\gamma\left(b - \frac{1}{2}c\right)$, while the gain for the politician is $\frac{1}{2}P + \alpha\frac{1}{8}c\gamma^2 - \frac{1}{2}\gamma\left(b - \frac{1}{2}(1-\gamma)c\right) = \frac{1}{2}P - \frac{1}{2}\gamma$

[8] The result that the net gain for society is negative when ex-post profits are negative need not hold under all specifications of the marginal product of labor. In general there is one effect pulling in the direction that projects may have a positive rate of return for society even when ex-post profits are negative. Profits are valued at the wage which is again equal to the marginal productivity of the last employee that is transferred from the private to the public sector, while the cost for society is the average and not the marginal productivity of the labor transferred. Thus, there may exist cases where projects with ex-post negative profits are good for society. This occurs when the difference between the marginal and average productivity of the labor transferred is so large that this effect outweighs not only the negative ex-post profit but also the investment cost of the project in the first period. The linearity in the marginal product of labor rules out this possibility. In the remainder we assume that negative ex-post profits are sufficient to make projects inefficient from the point of view of the society.

$\left(b-\frac{1}{2}c+\frac{1}{2}c\gamma\left(1-\frac{a}{2}\right)\right)<P-\frac{1}{2}\gamma\left(b-\frac{1}{2}c\right)$ (when $P\geq 0$). There are three reasons for the political evaluation of a project to differ from the evaluation that is optimal for society. First, politicians value their own expected increase in profits rather than the actual increase. Second, they value the increase in income of agents in their group by less than the actual increase in utility. Third, they value the cost in terms of wages by more than the cost for society, since they value the cost at the marginal cost of the last employee withdrawn from the private sector, while the cost for society is the average productivity of the labor transferred from private to public employment.

Consider next project A in case this is ex-post loss making. We then have the following:

Proposition 2. *When project A is ex-post loss making* (*and thus inefficient*) *it can be used by the incumbent to increase his reelection probability provided* $P\geq -\alpha\frac{1}{8}c\gamma^2$.

Proof 2. When $0>P\geq -\alpha\frac{1}{8}c\gamma^2$ it follows from Eqs. (6) and (7) that politician A will operate the project in case elected while politician B will not. Politician A may then credibly promise to group A voters that their income will be higher in case he rather than politician B wins the election. The difference D between income when the incumbent A wins compared to when the opposition B wins is given by $D=\frac{1}{4}c\gamma^2$ for group A agents (and zero for group B agents). By standard calculations on the probabilistic voting model we find the reelection probability in this case as

$$\Pi=\frac{1}{2}+h\frac{1}{8}c\gamma^2>\frac{1}{2} \tag{10}$$

□

Assume project A has $0>P\geq -\alpha\frac{1}{8}c\gamma^2$ and consider the alternative of investing in the project versus not investing in the project. The expected net gain by investing compared to not investing is found by Eqs. (3) and (10) as $h\frac{1}{8}c\gamma^2R-\frac{1}{2}\gamma\left[b-\frac{1}{2}(1-\gamma)c\right]+\left(\frac{1}{2}+h\frac{1}{8}c\gamma^2\right)\left(P+\alpha\frac{1}{8}c\gamma^2\right)$. The optimal strategy for the incumbent now satisfies:

Proposition 3. *When project A is ex-post loss making but has* $P\geq -\alpha\frac{1}{8}c\gamma^2$ *it will always be undertaken so as to increase the re-election probability of the incumbent provided the rents of being in office R are sufficiently high.*

Proof 3. It follows the from above that the strategy of biasing the election with the public project will dominate not launching the project when $R>\frac{4\left[b-\frac{1}{2}(1-\gamma)c\right]}{hc\gamma}-\left(1+\frac{4}{hc\gamma^2}\right)\left(P+\alpha\frac{1}{8}c\gamma^2\right)$. □

The higher the rents from being in office, the more likely is it that loss making public projects are undertaken. Public projects, even if highly inefficient, may be an efficient political strategy to secure rents from being in office. The reason for this is that promises to use other more efficient forms of redistribution such as taxes or transfers are not credible. Inefficient public investment projects, on the other hand, allow the incumbent to credibly commit before the election to transfer rents to his 'clientele' after the election, given that he remains in office. The opposition politician does not have the possibility of credibly promising the same income to group A agents in case he wins the election. The incumbent is thus able to tie the continuation utility of some voters to his own political success.

The model thus provides an explanation why politicians in countries with large oil rents launched so many inefficient investment projects. The higher the rents from holding office, the more economically inefficient investment projects can be and still be politically efficient. In contrast to resource rich countries, note that the higher b is, i.e. the higher the marginal productivity of labor (for any level of private sector employment), the less likely that such investment projects are undertaken. The reason is that in such economies the incumbent faces a high cost of labor, making it less attractive to employ clients to tilt the election outcome. Thus whether an economy is rich because of resource abundance or because of high productivity matters for the political outcome.

Also, note that the higher α is, i.e. the more a politician cares about the welfare of his own group, the more inefficient a project can be and still be undertaken. The reason is that this allows the politician to commit to inefficient redistribution also in the case where projects incur large future losses.

Can loss making projects crowd out profit making ones? Consider now the case where we have two competing public projects; a highly efficient project with ex-post profit $P^E > b\gamma - \frac{1}{2}c\gamma\left(1-\gamma\left(1-\frac{\alpha}{2}\right)\right)$ and a highly inefficient project with negative ex-post profit and $P^I + \alpha\frac{1}{8}c\gamma^2 > 0$. Furthermore assume that the condition in the proof of Proposition 3 holds. Now the first project is feasible for the politician to undertake because it is expected to yield a gain in utility without affecting the re-election probability, while the second project is feasible for the politician to undertake to tilt the election outcome. We then have

Proposition 4. *When* $R > \frac{4(P^E-P^I)}{hc\gamma^2} + \frac{\alpha}{2h} - P^I - \alpha\frac{1}{8}c\gamma^2$ *it is politically more efficient to undertake the economically inefficient than the economically efficient public project.*

Proof 4. The proposition follows by comparing the expected utility of the incumbent of launching the loss making project $h\frac{1}{8}c\gamma^2 R - \frac{1}{2}\gamma\left[b - \frac{1}{2}(1-\gamma)c\right] + \left(\frac{1}{2} + h\frac{1}{8}c\gamma^2\right)\left(P^I + \alpha\frac{1}{8}c\gamma^2\right)$ with the expected utility of launching the profit making project $\frac{1}{2}P^E + \alpha\frac{1}{8}c\gamma^2 - \frac{1}{2}\gamma\left[b - \frac{1}{2}(1-\gamma)c\right]$. □

For the incumbent, the advantage of launching the highly inefficient public project compared to the highly efficient one is that the former increases his probability of re-election. If the rents by holding office are sufficiently high the economically inefficient project will therefore be the most politically efficient one. The politician ends up picking losers rather than winners.

Also note that the higher h is, the more likely is it that the loss making investment project is the dominant political strategy. The more voters care about economy relative to other factors, the more the incumbent can tilt the reelection probability by committing to a loss making investment project. Thus, in this model, unlike many other models of electoral competition (see, e.g. Persson and Tabellini, 2000), when voters care much about economy, the economic outcome may actually be worse.

The same exercise as with project A can also be undertaken with project B. The important difference is, however, that when the incumbent operates the project in case he wins the election, politician B will also operate the project. Thus it is never possible for the incumbent to credibly promise group B voters higher income in case he rather than the opposition wins the election. As a consequence, only projects of type B that fulfill the condition in Proposition 1 is undertaken.

3. Concluding remarks

A central puzzle in the political economy of development is why investment is inefficiently allocated. In many cases this question is far more important than why there is underinvestment. Killick (1978), p. 207 dispairingly concludes in the Ghanaian case that "much of the 'investment' in the first half of the sixties was actually a form of consumption yielding few, if any, returns in the longer run. The larger volume of 'investment'. . .could not compensate for the low-productivity uses to which it was put". The evidence suggests that this misallocation takes place even when its implications are understood. Thus it is not due to incompetence. Indeed, developing economies such as Zambia and Ghana had teams of economic advisers who undertook intensive cost benefit analyses.

In this paper we have argued that the construction of white elephants should be seen as redistribution aimed at influencing the outcomes of elections. The political motivation behind white elephants is clearly recognized in the political science and development literatures, with Herbst (1989), p. 81 noting that "The main reason why it is so difficult to reform, much less privatize, Africa public sector enterprises is because the central regime does not believe it is in its own political interests to reduce their size and scope. . . parastatals have traditionally been used as a way to distribute patronage". Yet this literature has not been able to explain why redistribution should take place in such an inefficient form.

Our theory suggests that the reason why redistribution takes the form of socially inefficient projects is that only some politicians can commit to build such projects. All politicians value the revenues that efficient projects tend to generate and thus all politicians can credibly promise to maintain such projects. However, when politicians represent groups, a particular politician who values the welfare of the beneficiaries of a loss making project may find it optimal to keep operating it when a politician from a different group, who only values the revenues, cannot. In this case such loss making projects can be politically attractive because they affect voting behavior. There is then a trade-off between efficient projects, which generate revenues, and inefficient ones, which influence political outcomes. In this trade-off inefficient projects can be more attractive, particularly when the value of being in power is large.

Killick asks of the Nkrumah government (1978, p. 208), "By what tortured logic did it continue to starve existing industries of materials and spares in order to import the capital equipment needed to create yet more industries?" In this paper we hope to have at least partially elucidated what we feel to be this 'tortured logic'.

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