Just How Sub-Optimal is Robert Mugabe? Optimizing Candidates Seeking Elected Office.*

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ABSTRACT: We consider the optimal choice set of candidates standing for elected office. The decision dimensions are in the number of candidates standing for election, and the experiential base of the candidates standing for election as measured by the length of prior experience held by the candidates and the proportion of candidates with such prior experience.
We find that while there are benefits that accrue to having a larger choice, the optimal number of candidates is strictly finite.
Second, to justify an increase in the optimal length of prior experience requires strong increases in the ratio of benefits that accrue from additional experience to the cost of abuse of priviledge. The conditions under which an increase in the length of prior experience can be justified is where the cost associated with abuse of privilege is negligible. This would require the development of appropriate formal (legal and constitutional) and informal (civil society) institutions that ensure that abuse of office remain negligible.
Finally, we allow the number of electoral candidates, the length of their prior experience, as well as the proportion of candidates with experience to vary. Strong non-linearities ensure that even very small changes in the parameters that characterize a society can generate strong changes in the optimal experiential base of the political class. Where political systems are slow to change, and do so by means of small incremental changes, severe dissatisfaction with political systems is readily explained in the current model as the result of very small social changes. Moreover, optimal pairings of length of experience and the proportion of candidates with prior experience may not exist. Hence societies may be condemned to suboptimality even should the political system prove to be amenable to change, rendering disaffection endemic to the political system.
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1 Introduction

Voters in a number of developed democracies currently face unprecedented levels of income, health, education, security from crime and catastrophic events, due in no small measure to the quality of the policy responses from the public sector. Yet at the same time dissatisfaction with those seeking political office also is at unprecedented levels.[1] How do we account for this conundrum? Sound policy environments, yet disgruntlement with the political classes. One possibility is that the electorate cares not only about the nature of the policy regime that issues from their choices, but that the nature of the choice set itself offers satisfaction. Political parties that have honed the hunt for the median voter to a fine science may generate policy that suits the voter better than any other - but at the cost of political representatives that appear homogenized to the point of inseparability, denuding the electorate of choice except in the formal sense. One commentator puts it as follows:

> In the early days of the American republic, citizens were offered the choice between George Washington and John Adams, John Adams and Thomas Jefferson, Thomas Jefferson and Aaron Burr. In recent years the voters have been offered the choice between Michael Dukakis and George Bush, George Bush and Bill Clinton, Bill Clinton and Bob Dole. No wonder so many people think Darwin was wrong. (Orren 1997:77-8.)

The reduction of what is perceived as genuine choice and principled alternatives, of visionaries jousting on the grand stage of ideas to bland homogeneity devoid of much meaning in itself appears to matter to voters.

But the significance of the nature of the choices faced by electorates has more general reach than is implied by the disaffection by the voters in the world's rich democracies.

Andrés Pastrana Arango was in office as Colombia's President from 1998-2002. He had brought to Colombia's senior executive position a successful program of fighting corruption, reducing inefficiencies in public services, improving morale in the public sector. By the time of the following Colombian presidential election of 2002, Pastrana had not yet proved successful in addressing the deep-rooted sources of extreme violence in Colombia. Given the dangerous interdependence between political groups committed to a violent usurpation of power and drug cartels in Colombia, it would have amounted to little short than a miracle had Pastrana resolved civil conflict as well as reduced corruption in government.

Deep-seated social problems are unlikely to be resolved overnight, or even over a four year period of office by even the most committed and able of politicians. Time is needed to address, prioritize and then tackle problems. The turn-around of Naga city in the Philippines by mayor Jesse Robrero illustrates the point. Beset by corruption, poor public services, inefficient tax collection

[1] See the discussion in Nye (1997).

and a city council and bureaucracy reluctant to change, Robrero undertook a sequence of reforms over a period of three four year terms in office that transformed the city, catapulting it from third- to first-class status in the official ranking of Philippine cities. Key to his success was a careful sequencing of reforms, achieving recognizable and early success in order to reach for harder goals in policy intervention designed to address more deep-seated problems, getting public buy-in by participation and providing evidence of real achievements.

Success takes time in office, especially when the problems are hard. Experience in office helps in designing good policy intervention. This is a lesson that seems to follow from the anecdotal evidence. Yet in the case of Colombia's presidency this possibility is constitutionally prohibited. No Colombian may stand for more than one four year term of office. Given the success, the efficiency and the cleanness of the Pastrano administration, and that his work was incomplete, one cannot but help feeling that Colombians would have benefitted from at least having the choice of reelecting him.

Yet anecdotal evidence also suggests that we can have too much of a good thing. After 20 years in office as the President of Zimbabwe, Robert Mugabe demonstrated deep intolerance of the first signs of credible and wide-spread democratic opposition in the form of the Movement for Democratic Change (MDC) and its trade union leader Morgan Tsvangirai. What followed was intimidation, violence, coercion at the polls, distribution of food aid only to members of Mugabe's own party, personal enrichment through a misuse of public funds by members of the ruling elite in ZANU-PF, and the imposition of land reform designed for populist appeal rather than efficient food production. Despite pursuing policies that were sound from a developmental perspective in the initial years of his presidency, with strong investment in human capital, in health services, particularly for the poor, Mugabe now appears to fit the caricature of the desperado dictator from Africa, contemptuous of the rule of law and due political process. Admittedly the brutal suppression of opposition amongst the Matabele ethnic grouping (Mugabe is Shona) during the 1980's by the North Korean trained 5'th Battalion which resulted in thousands of victims left unaccounted for was an early indication that Mugabe's democratic instincts were perhaps less than deeply ingrained. Nevertheless the scale and extent of the response to the MDC suggests that for Mugabe power in its absolute variant has done the work predicted by Acton.

A second lesson we might wish to draw from our anecdotal evidence is that too much of the good thing, experience, is no good thing at all. Having real, credible alternatives to holders of office hoary with experience and the abuse of power they have perfected in office, is nothing if not appealing. Bitter experience with just such abuse has led many Latin American countries to impose strict term limits on office - with Colombia providing a particularly enthusiastic example.

The USA also has witnessed the clash of the two lessons we have drawn from the anecdotal evidence. Ronald Reagan, on stepping down after his second term in office, clearly concerned that the world would be deprived of the opportunity of seeing more of him in office, vowed to campaign for the lifting of the two-term

limit on American presidents.[2]

One has to ask. Did we want more of Ronald Reagan? Less of Robert Mugabe?

This paper is concerned with identifying the optimum that is implied by our two anecdotal lessons. And to be clear, the optimum attaches to the choice set itself which agents face. The issue is not the final selection that voters make, and the policies that follow as a result. Instead, the problem concerns the possibility that voters derive utility directly from the nature of the options that the election presents to them, of clarifying the elements that might determine an optimum in this regard.

The first section of the paper identifies the elements of the problem in some detail. There are at least three crucial dimensions to optimizing the choice set from which electorates choose office bearers. First, the electorate is held to value choice itself. More candidates represent more alternative policy bundles, and society gains from the option values that are implied. Second, improving the experiential base of the candidates standing for office is seen to add to the quality of the policy bundles they design. And experience accumulates both through the proportion of candidates standing for office who hold experience, as well as through the length of the service experience they have obtained. But it is not all up-side. The third element of the decision problem recognizes both the information and computational choice costs generated by growing numbers of candidates, as well as the abuse of office costs that develop as elected officials hold office for increasing lengths of time. Finally, one has to recognize that identifying the optimal choice set from which an electorate chooses is inherently concerned with the design of an electoral system. As such it is something that persists over time, rendering the choice problem one of intertemporal optimization.

Remaining sections of the paper are concerned to identify characteristics of the optimum under different conditions governing length of prior experience and the proportion of candidates with prior experience of office. In doing so we are *not* concerned with the problems voters face in making their preferences known in voting processes - important as such social choice problems are.[3] We are also not concerned with the problem that politicians may turn out to be less committed to campaign promises once in office than when standing for election. Again, public choice problems are serious and deserving of close attention. But not here, beyond the recognition that lengthening service leads to increased costs in the form of abuse of office.

The concern of this paper is purely in optimizing the choice set voters face in elections.

We have found little prior literature on this precise question. Analysis of institutional design so as to preclude both the tyranny of the majority and tyranny

[2] "If you want to vote for someone, we shouldn't have a rule that tells them they can't. There are plenty of safeguards against the power of the presidency that would prevent him from becoming a lifetime monarch." Interview with Ronald Reagan prior to leaving office on the 22'nd Amendment.

[3] A useful overview of these questions can be found in Brams and Fishburn (2002).

of a dictator, without eliminating incentives for legislators to generate new legislation is provided by Aghion, Alesina and Trebbi (2001), leading to some discussion of the desirability or otherwise of term limits specifically - on which see also Mondak (1995). McGuire and Olson (1996) and Olson (2000) provide an analytical framework to consider the impact of institutional governance structures on the degree to which policy choices prove compatible with general social interests. An extensive literature has developed examining the link between the degree of accountability enforced on politicians by institutional political structures, the nature of the policies pursued by the politicians, and the economic performance which follows. Examples are provided by Alesina, Glaeser and Sacerdote (2001), Austen-Smith and Banks (1989), Besley and Case (1995a,b), Harrington (1993), Lizzeri and Persico (2001), Lott and Davis (1992), Lott and Reed (1989), Milesi-Ferretti, Perotti and Rostagno (2002), Persson and Tabellini (1999, 2000), Poterba (1994), and Rogoff (1990). A further literature examines the question of how electoral candidates should optimally pursue voters. Within the US electoral college system, Brams and Davis (1974), Colantoni, Levesque and Ordeshook (1975) , Snyder (1989), and Strömberg (2002) offer examples, and see also Dunne, Reed and Willbanks (1997). Finally, the question of what determines the nature of electoral reform has also received attention, see Boix (1999), Lehoucq (2000) and Roberts and Wibbels (1999).

But within this literature little attention is paid to the possibility that the nature of the choice set that agents face may itself be the source of utility to voters. It is this suggestion that the present paper takes seriously.

In section 2 of the paper we outline the elements of the decision problem. Section 3 deals with the optimal time path in the number of electoral alternatives. Section 4 extends the analysis to the optimal length of experience that attaches to electoral candidates, and section 5 to the analysis of the proportion of candidates standing for office that hold prior experience.

Detailed results are left for the body of the paper. Nevertheless we note at the outset that the literature often assumes that the source of disaffection with political processes arises from social choice problems (poor preference aggregation), or public choice problems (government failure of some form). A core result to emerge from the present analysis is that it is feasible that the very choice set that voters face in political systems can be the source of the disaffection. Moreover, it is apparent that the disaffection may occur precipitously for very small social changes, prove severe, protracted, and endemic. The source of social disaffection with political processes may not adhere to the nature of the political candidates, nor to the policies which they pursue. Instead, the source of voters' disaffection may be the underlying structure governing the choice-set they face.

2 The Social Objective Function

Our concern here is not with the choice of specific policy bundles, and their impact on social welfare. Nor is the focus on the nature of the selection process

by means of which a society elects its officials. For this reason we abstract from all social choice and public choice problems. While these are important in their own right, they are not the topic of our analysis.

Our concern is to determine the optimal field of candidates from which a society will choose its office bearers.

In order to enable us to achieve this focus, we begin with the following propositions, which will form the basis of the analysis that follows.

Proposition 1 (Uniqueness) *Each candidate in the electoral process can be represented by a unique bundle of policies.*

Remark 1 *It follows that the choice the society faces in the election is between real alternatives. Since each candidate has a unique policy bundle, candidates are proposing to implement policy intervention that will lead to distinctly different outcomes.*

Proposition 2 (Electoral Determinism) *Electoral processes issue in the candidate representing a policy bundle that uniquely represents the policy bundle preferred by society.*

Remark 2 *By this we do not mean to say that electoral processes are not subject to many features that may result in policy bundle outcomes that are not preferred, and that even render the very notion of a "social preference" subject to deep ambiguity. We merely mean that we are here abstracting from these difficulties.*

Proposition 3 (Honesty) *Candidates standing for election on winning office face rigorous formal (eg. courts) and informal (eg. the press) institutional mechanisms that rigorously oblige them to represent precisely the policy bundle they advocated in the electoral process.*

Remark 3 *By this we do not mean that candidates are not rational agents who maximize their personal objective functions, and that prove resourceful in finding means not to honor their pledges. Instead we abstract from the extensive problem of government failure despite its real world prevalence.*

Proposition 4 (Irrelevance of Coalitions) *Implementation of policy is not reliant on the formation of coalitions between the elected candidate and other elected officials. Election ensures the possibility of pursuing the policy platform.*

Remark 4 *Again this is clearly an abstraction. In parliamentary democracies the formation of coalitions in pursuing policy goals is of the essence, regardless of whether the system is by first past the post in specific constituencies, proportional representation, two- or multi-party in nature. This serves to dilute the identification of each electoral candidate (or policy bundle) with a specific policy outcome, and it is this we are abstracting from. The reason for the abstraction is to strictly focus attention on the quality of the candidate standing for election. Alternatively, the implication is that the analysis which follows is best suited to a consideration of direct elections of chief executive positions, such as the American presidency, or gubernatorial positions in the US states.*

The advantage of formulating our problem in this manner, is that an expanding number of candidates for office in an election immediately comes to represent an expanding set of alternative policy bundles (by uniqueness). Each voter is thus more likely to encounter a policy bundle that meets their needs as the number of candidates standing for office expands also. By exercising their vote, voters thus have a greater chance of being able to ensure that their preferred policy bundle prevails against others (by electoral determinism), and if their preferred candidate is successful in getting elected, of realizing their preferred policy bundle (by honesty), given the independence of the pursuit of the policy platform from coalition building (by irrelevance of coalitions).

Proposition 5 (Social Utility) *An expansion of the choice set faced by voters through an increase in the number of candidates in elections, N, directly serves to increase the utility of society. However, while increasing the choice set of voters through additional candidates and hence policy bundles increases social utility indefinitely, the impact of each successive rival in the electoral contest is somewhat more muted than the preceding. Marginal utility from increasing the number of electoral candidates is diminishing.*

But all policy bundles are not created equal. Most candidates who stand for public office are more grizzled than the most recent high school product. Presumably experience tends to add soundness to one's deliberation about policy platforms - at least most voters seem to think so. In particular, incumbents in elected office tend to experience a substantial advantage over other candidates. Experience of candidates standing for office must thus be recognized as part of social utility. The average experience of candidates standing for office can be raised in two distinct dimensions. Average candidate experience can be raised by raising the *proportion* of candidates with previous experience in office. It can also be raised by increasing the *length* of prior policy experience those candidates who have held office have had.

Proposition 6 (Proportion) *The utility of voters is influenced by the experience that the candidates bring to bear on the design of their policy bundle. Utility is assumed directly responsive to the proportion, $0 \leq \omega \leq 1$, of candidates seeking election who have previously held office.*

Proposition 7 (Term of Service) *The utility of voters is influenced by the experience that the candidates bring to bear on the design of their policy bundle. Utility increases in the time of service, τ. While for the level of generality of our discussion experience could be defined as experience in public office generally, for the sake of precision we define it here as prior experience in the office for which election is being sought. The greater the experience of a candidate, the greater the perceived quality of the policy bundle, hence the greater the associated utility. Once again, we assume diminishing marginal returns to additional experience in terms of the quality of design of policy bundles that emerges.*

Proposition 8 (No Cronyism) *To ensure that ω, τ are related strictly to voter preferences, cronyism is presumed absent by virtue of public institutions*

that ensure probity in the selection of candidates. We therefore exclude any possibility of selecting electoral candidates to serve the interests of established elected candidates.

So a higher ω has the advantage of improving the quality of the policy design that those candidates with experience propose. But where an increasing proportion of the candidates standing for office have prior experience, there is diminished opportunity for new policy platforms to emerge. While the electorate is considered to respond positively to an increased number of policy platforms in the social utility function, with an increasing proportion of electoral candidates with prior experience, the likelyhood of new ideas entering the policy platforms also diminishes, as long as electoral candidates maintain consistency of principle in formulating their platforms. One of the standard complaints about western-style democratic systems, is that the domination of political life by entrenched political parties that ensure party discipline and conformity with party ideology and policy programmes by its representatives, prevents the emergence of electoral candidates that have truly novel and innovative ideas. Any ideas that are heterodox to the party line are eliminated from party members before they have any chance of emerging as an electoral prospect.

The result is stasis and inertia in the development of new initiatives in policy. Such a lack of new ideas and new blood in the formulation of policy is a source of disutility to the electorate. New blood in the choice set the electorate faces, in terms of the principles that inform policy direction, in terms of concrete policy proposals, and in terms of the policy bundles that are formulated, diminishes as the proportion of candidates with prior experience rises. Moreover, with a rising proportion of candidates that hold prior experience, the possibility of "collusion" amongst elected officials increases also. This is not a reflection of cronyism (selecting other candidates to serve the interests of established elected candidates), nor of coalitions, since the cooperative behaviour does not take the form of a permanent (formal) alliance but of *ad hoc* cooperation of convenience, the patterns of which can be fluid.

Rather teh risk of collusion here is a reflection of the diminishing information and coordination costs associated with negotiating with other elected candidates that share the same experience. The implication is that elected candidates with a shared experience, by virtue of having the experience of serving together, face lower information and coordination costs of forging agreements with one another. They therefore come to prefer to follow the policy line established by precedent and past agreements, rather than coming to pursue the new policy initiatives that would be required if agreements have to be struck with newly elected candidates without prior experience. Thus the rising utility that the electorate derives from a rising proportion of electoral candidates with experience due to better formulation of policy bundles, is off-set by a declining utility due to the diminished likelyhood of new blood entering the arena of policy formulation.

One qualification to the desire for new blood is worth adding. The general point is that new ideas in political discourse diminishes when the proportion of

candidates with prior experience rises too far. However, where the ω-proportion is coming off a very low base, some knowledge of policy omissions, policy failure, and the process of developing policy platforms (hence at least some experience amongst candidates) may act as a positive stimulus to policy ideas. The implication is of a non-linearity in the relation between social utility and the proportion of candidates with prior experience. The new blood principle implies declining utility in ω, the enabling stimulus of having $\omega \neq 0$, implies some positive payoff for social utility in the first instance.

Proposition 9 (Enabling) *Where the proportion of candidates with prior experience is sufficiently low, having at least some experience amongst candidates may serve as a stimulus to the development of policy platforms, by identifying policy omissions and failure available for redress by intervention.*

Proposition 10 (New Blood) *The utility of the electorate declines in the proportion of candidates with prior experience, since a rising proportion of prior experience prevents the emergence of new innovative policy platforms.*

Proposition 11 (Collusion) *The utility of the electorate declines at an increasing rate in the proportion of candidates with prior candidates, since as the proportion rises, so the information and coordination costs of the policy status quo falls, further diminishing the likelyhood of realizing the policy platforms of those candidates who do bring new blood to the policy debate.*

Thus we have the general formulation:

$$\begin{aligned} U &= U\left(N, \omega N\left(\tau\right), \omega\right) \\ s.t.\ U_N &> 0,\ U_{NN} < 0, \\ U_\omega &= indeterminate, U_{\omega\omega} < 0 \\ U_\tau &> 0, U_{\tau\tau} < 0 \end{aligned} \tag{2.1}$$

One example of such a social utility function might be given by:

$$U = aN - bN^2 + \sum_{i=1}^{\omega N} c \ln\left(\tau_i\right) + \left(m\omega - n\omega^2\right),\ a, b, c, \tau, m, n > 0 \tag{2.2}$$

in which the additional utility derived from additional candidates with experience is additively linear (by proportionality), though increasing experience of any given candidate i is associated with diminishing returns (by term of service). The terms $\left(aN - bN^2\right)$ capture the import of Propositions 1 through 5, the term $\sum_{i=1}^{\omega N} c \ln\left(\tau_i\right)$ of Propositions 6 through 8, and the term $\left(m - n\omega^2\right)$ of Propositions 9 through 11.

An expanding choice set facing agents in elections is not without costs, however. One such cost is the informational demands that additional candidates place on voters. Adding more candidates to an electoral list generates an ever growing burden in terms of the number of distinct policy bundles that require comparison (by uniqueness). In addition to the information costs of additional

candidates there are also computational costs, that arise from strategic considerations. As the number of candidates increases, so voters have to ascertain not only which candidates represent their own most preferred policy bundle, but also which policy bundle is the one most likely to have electoral success while representing their own preferences most closely.

Moreover, the greater the additional number of candidates (all of whom are unique in their policy platform), the greater such information and computational costs will prove. Information costs are increasing in the additional candidates since differences between policy bundles are likely to be increasingly finely grained with increasing candidates (differentiation becomes increasingly difficult), making the identification of differences between candidates information search intensive. But most importantly, computational costs increase as the number of additional candidates rises. The addition of an increasing number of candidates, with an increasingly finely grained set of differentiations between platforms, makes the strategic choice of the candidate most likely to win election and to be closest to the voter's own preferences increasingly complex. Particularly since each strategically acting voter is aware that other voters are acting similarly strategically the complexities of a Keynesian beauty competition loom for each individual voter.

As a final consideration, we assume that for any given number of candidates, N, once a ranking of the associated policy bundles has been completed, no information and adjustment costs are generated. The costs arise only where there is an entry (or exit) of candidates from the electoral process, since this requires a revision of the ranking of policy bundles that the electorate previously held. Thus information and adjustment cost are triggered where $dN/dt \neq 0$, where t denotes time. This is an extension of the honesty proposition, precluding the alteration of candidates' policy platforms not only after the election, but prior to election also.

Proposition 12 (Adjustment Cost) *Information and computational costs are positive and increasing in dN/dt.*

In addition, while experience in office lends itself to improvement of policy design, it also offers opportunities for the abuse of privilege. The greater the length of time spent in office by candidates, the greater their ability to influence policy design so as to facilitate abuse of official privilege, and to appoint non-elected office bearers to further personal rather than public interest. The reasons for this are twofold. First, as the length of office of candidates increases so their seniority in office increases also, allowing for the capture of ever more influential positions. This might be represented by the number and type of committees the elected officials come to serve on, and the extent to which they can come to influence the agenda of such committees by occupying senior positions within the committee itself. Second, experience in office allows for ever greater mastery of the more arcane nuances of procedure governing action within elected office. Returns in terms of power from the mastery of procedure can be substantial, but concomitantly so is the opportunity for abuse of privilege. Given the strong

returns in terms of power to experience in at least two dimensions therefore, abuse of privilege increases in the length of service in office also, and does so at an increasing rate.

Proposition 13 (Abuse of Privilege) *Abuse of privilege increases in the length of service in office, τ.*

Proposition 14 (Increasing Returns to Experience) *Abuse of privilege not only increases in the length of service in office, τ, but does so at an increasing rate.*

This gives the general formulation of the social cost function:

$$\begin{aligned} C &= C\left(\overset{\bullet}{N}, \omega N\left(\tau\right), \omega\right) && (2.3)\\ s.t.\ C_{\overset{\bullet}{N}} &> 0,\ C_{\overset{\bullet}{N}\overset{\bullet}{N}} > 0 \\ C_{\tau} &> 0, C_{\tau\tau} > 0 \\ C_{\omega} &> 0. && (2.4) \end{aligned}$$

One example of such a social electoral cost function might be:

$$C = \alpha\ \overset{\bullet}{N} + \beta\ \overset{\bullet}{N}^2 + \sum_{i=1}^{\omega N} e^{\delta\tau_i},\ \alpha, \beta, \delta, \tau > 0 \tag{2.5}$$

where e denotes the natural exponent. As for the social utility function, costs are linearly additive in the candidates holding such experience. The contrast here is that cost is an increasing function of the length of service held by any given candidate for future office. Thus the terms $\left(\alpha\ \overset{\bullet}{N} + \beta\ \overset{\bullet}{N}^2\right)$ capture Proposition 12, the term $\sum_{i=1}^{\omega N} e^{\delta\tau_i}$ captures Propositions 13 and 14.

Hence net social utility is given by:

$$\begin{aligned} F &= U - C && (2.6)\\ &= aN - bN^2 - \alpha\ \overset{\bullet}{N} - \beta\ \overset{\bullet}{N}^2 + \sum_{i=1}^{\omega N}\left(c\ln\left(\tau_i\right) - e^{\delta\tau_i}\right) + \left(m\omega - n\omega^2\right) \end{aligned}$$

The assumption is that $a, b, c, \alpha, \beta, \delta, m, n,$ are behavioral parameters beyond immediate control. It goes without saying that societies, even districts within a society may differ in these parameters. For instance, we might anticipate that some societies have evolved institutions that may render $\delta \to 0$, such that very little abuse of office is feasible. In other societies the reverse may be true. Similarly with respect to the other parameters. In the present context, we take the parameters as given, and concern ourselves with their consequences.

This leaves net social utility subject to influence via three channels. By changing the number of candidates standing for election, N. By changing the proportion of candidates standing for election who have prior experience, ω. By altering the length of time candidates have previously served in office, τ.

The decision problem is now the maximization of net social utility.

One issue concerns the design of an optimal *single* election. This is a straightforward problem requiring the application of relevant first and second order conditions to the net social utility expression presented above.[4] A more interesting problem would be to consider the question of what might be an optimal electoral process that is to inform *all* future elections. This renders the problem dynamic rather than static, viz. to:

$$\begin{aligned} \max! V &= \int_0^{\infty} F e^{-\rho t} dt \qquad (2.7) \\ s.t.\ N(0) &= N_0, \\ \tau(0) &= \tau_0, \\ \omega(0) &= \omega_0, \end{aligned}$$

where ρ denotes the social rate of time discounting.

In developing the analysis, the paper proceeds in three steps. In the first both the length of experience, τ, and the proportion of candidates with experience, ω, is held fixed, allowing only the number of candidates to be the decision variable in the optimization problem. In the second and third sections we allow both the τ- and ω-dimension respectively to enter the decision problem as distinct choice dimensions also. Two motivations underlie this expositional choice. The most immediate is that it serves to clarify the structure of the underlying problem, and allows for an improved understanding of the features of the solutions that emerge. But in addition, societies have chosen to define their choice problem in different ways, with not all societies allowing variation in all three choice dimensions. While the paper solves the general problem in all three dimensions (in the third section), it also allows for a consideration of the impact of fixing the problem in either one or both of the τ- and ω-dimensions.

3 The Dynamic Decision Problem under a Fixed Length of Prior Experience, and a Constant Proportion of Candidates with Prior Experience

The first case we consider makes two simplifying assumptions, which we relax in the two succeeding sections of the paper. We assume first that all elected office bearers are only allowed to serve a fixed term of office, rendering τ a fixed constant. This is hardly a novel feature of electoral processes. Presidents of the United States are allowed to serve only two four year terms. Presidents of Colombia are allowed only a single four year term of office. The second simplifying assumption we invoke is that ω, the proportion of candidates for election

[4] Assuming that all incumbent office bearers have served the same period in office, we would have $F = \left[a + \omega\left(c\ln(\tau) - e^{\delta\tau}\right)\right] N - bN^2 - \alpha \dot{N} - \beta \dot{N}^2 + \left(m\dot{\omega} - n\omega^2\right)$, and hence $N^* = \frac{a+\omega\left(c\ln(\tau)-e^{\delta\tau}\right)}{2b}$, $\dot{N}^* = \frac{-\alpha}{2\beta}$. τ^* follows from the solution to $\frac{c}{\tau} = \delta e^{\delta\tau}$. $\omega^* = \frac{N\left(c\ln\tau - e^{\delta\tau}\right)+m}{2n}$, such that ω^* is dependent on τ^*.

is fixed also. This might be due to some underlying structural features of the process that determines attempted entry into public life, it might be due to formal regulation (limiting the number of previous office bearers to seek subsequent reelection - given finite life spans and the presence of term limits - would presumably provide an upper bound to the number of possible candidates that could stand, for instance). We relax these restrictions in subsequent sections of the paper.

In addition, to aid analytical tractability, we assume that all incumbent office bearers have served the same period in office. This, and the assumption of a fixed τ, ω, allows us to rewrite the objective functional as:

$$\begin{aligned} \max! \, V &= \int_0^{\infty} \left(\left[a + \omega \left(c \ln(\tau) - e^{\delta \tau} \right) \right] N - bN^2 - \alpha \dot{N} - \beta \ddot{N}^2 + (m\omega - n\omega^2) \right) e^{-\rho t} dt \\ s.t. \, N(0) &= N_0. \end{aligned} \tag{3.1}$$

The only remaining means of changing net social utility is by means of the state variable N.

This then gives the Euler Equation:

$$\ddot{N} - \rho \dot{N} - \frac{b}{\beta} N = \frac{\alpha\rho - a - \omega \left(c \ln(\tau) - e^{\delta \tau} \right)}{2\beta} \tag{3.2}$$

with general solution:

$$N(t) = A_1 e^{r_1 t} + A_2 e^{r_2 t} + \overline{N} \tag{3.3}$$

where:

$$r_1, r_2 = \frac{1}{2} \left(\rho \pm \sqrt{\rho^2 + 4\frac{b}{\beta}} \right) \tag{3.4}$$

$$\overline{N} = \frac{a + \omega \left(c \ln(\tau) - e^{\delta \tau} \right) - \alpha\rho}{2b} \tag{3.5}$$

with $\overline{N}$ denoting intertemporal equilibrium. Since $r_1 = \frac{1}{2} \left(\rho + \sqrt{\rho^2 + 4\frac{b}{\beta}} \right) > 0$, prevention of an explosive time path in N (not all agents in society can be office bearers, and $N = \infty$ is even less feasible) requires the restriction $A_1 = 0$. Since:

$$\begin{aligned} N(0) &= N_0 = A_2 + \overline{N} \\ A_2 &= N_0 - \frac{a + \omega \left(c \ln(\tau) - e^{\delta \tau} \right) - \alpha\rho}{2b} \end{aligned}$$

giving us the particular solution:

$$N^*(t) = \left(N_0 - \frac{a + \omega \left(c \ln(\tau) - e^{\delta \tau} \right) - \alpha\rho}{2b} \right) e^{\frac{1}{2} \left(\rho - \sqrt{\rho^2 + 4\frac{b}{\beta}} \right) t} + \frac{a + \omega \left(c \ln(\tau) - e^{\delta \tau} \right) - \alpha\rho}{2b} \tag{3.6}$$

which given:

$$F_{\dot{N}\dot{N}} = -2\beta e^{-\rho t} < 0, \quad \begin{vmatrix} F_{\ddot{N}\ddot{N}} & F_{\dot{N}N} \\ F_{N\dot{N}} & F_{NN} \end{vmatrix} = 4b\beta e^{-2\rho t} > 0$$

satisfies the second order condition for a maximal.

The particular solution also allows us to specify the optimal time rate of change in presidential candidates:

$$\overset{\bullet}{N}^{*}(t) = \frac{1}{2}\left(\rho - \sqrt{\rho^2 + 4\frac{b}{\beta}}\right)\left(N_0 - \frac{a + \omega\left(c\ln(\tau) - e^{\delta\tau}\right) - \alpha\rho}{2b}\right)e^{\frac{1}{2}\left(\rho - \sqrt{\rho^2+4\frac{b}{\beta}}\right)t} \quad (3.7)$$

Remark 5 *Where we ignore the search, information and computational cost that attach to the introduction of additional candidates standing for election, the net social utility function reduces to:*

$$G = [a + \omega c\ln(\tau)]\,N - bN^2$$

so that the optimal number of candidates for election follows from the first order condition:

$$\begin{aligned}\frac{dG}{dN} &= a + \omega c\ln(\tau) - 2bN = 0\\ \therefore\ N_S^* &= \frac{a + \omega c\ln(\tau)}{2b}\end{aligned}$$

It follows immediately that this lies above the intertemporal equilibrium of the dynamic decision problem faced by society:

$$\overline{N} = \frac{a + \omega\left(c\ln(\tau) - e^{\delta\tau}\right) - \alpha\rho}{2b} < N_S^* = \frac{a + \omega c\ln(\tau)}{2b}$$

due to both the adjustment cost term $\alpha\rho$, as well as the abuse of privilege cost term $e^{\delta\tau}$.[5]

The optimal time path in the number of electoral candidates, 3.6, has three distinct components. First, the *divergence* component, $\left(N_0 - \overline{N}\right)$, indicates the magnitude of the divergence between the starting level of electoral candidate numbers, N_0, and the intertemporal equilibrium number of electoral candidates, $\overline{N} = \frac{a+\omega\left(c\ln(\tau)-e^{\delta\tau}\right)-\alpha\rho}{2b}$. The stronger the divergence between the initial number of candidates and intertemporal equilibrium, the stronger the increase in the number of candidates at any given time point, since $\frac{\partial \overset{\bullet}{N}^{*}(t)}{\partial \overline{N}} > 0$ (see 3.7). Second, the *time path* component, $e^{\frac{1}{2}\left(\rho - \sqrt{\rho^2+4\frac{b}{\beta}}\right)t}$, characterizes the trajectory that $N^*(t)$ follows from N_0 through $\overline{N}$. The path is determined by the social rate of time discount, ρ, the parameter determining the rate of decrease of the marginal utility from additional candidates, b, and the parameter determining the rate of increase of the marginal cost from changing the number of candidates, β. Third, *intertemporal equilibrium*, $\overline{N} = \frac{a+\omega\left(c\ln(\tau)-e^{\delta\tau}\right)-\alpha\rho}{2b}$, the optimal number of candidates to emerge over time.

[5] Note that this is true even for the static problem that allows for the benefits and costs of experience, since $\overline{N} = \frac{a+\omega\left(c\ln(\tau)-e^{\delta\tau}\right)-\alpha\rho}{2b} < N^* = \frac{a+\omega\left(c\ln(\tau)-e^{\delta\tau}\right)}{2b}$.

We can note immediately some intuitively appealing characteristics about intertemporal equilibrium. Since $\frac{\partial \overline{N}}{\partial a} > 0$, $\frac{\partial \overline{N}}{\partial c} > 0$, factors that either increase (a.) the marginal utility attaching to each additional candidate standing for election, or (b.) the benefit that attaches to experience, will increase the optimal number of candidates standing for election in intertemporal equilibrium. Since $\frac{\partial \overline{N}}{\partial b} < 0$, $\frac{\partial \overline{N}}{\partial \delta} < 0$, $\frac{\partial \overline{N}}{\partial \alpha} < 0$, $\frac{\partial \overline{N}}{\partial \rho} < 0$, factors that increase (a.) the rate of decrease in the marginal utility attaching to each additional candidate standing for election, or (b.) the growth rate in abuse of privilege, or (c.) the marginal cost attaching to the growth of additional candidates standing for election, or (d.) the time rate of discount, will decrease the optimal number of candidates standing for election in intertemporal equilibrium.[6]

Finally, note that in terms of the costs of changing number of candidates, first order effects impact only on intertemporal equilibirum, second order effects only on the time path component of the optimal time path in N. By contrast, both first and second order effects in the benefits attaching to the number of candidates affect intertemporal equilibrium, while second order effects only affect the time path component of the optimal time path in N.

This section has shown that the maximization of net social utility is not simply a matter of choosing the largest number of candidates running for election. Intertemporal equilibrium restricts the number of candidates. The final number of candidates is determined by the magnitude of the parameters that specify the utility derived from electoral candidates (a, b), parameters that fix the adjustment cost to additional candidates entering the electoral contest (α), the parameters specifying both the benefits (c) and costs (δ) derived from prior experience in office, the proportion of candidates with prior experience (ω) and the length of their experience (τ), as well as the social rate of time preference (ρ).

Thus far our discussion of the characteristics of the optimal time path in N has excluded all consideration of the impact of prior experience on the optimal time path - since both dimensions of prior experience, τ and ω, were assumed to be fixed. We turn now to a more detailed consideration of the τ- and ω-dimensions.

4 Allowing Variation in the Length of Prior Experience in the Dynamic Decision Problem

Not all societies fix the length of prior service. Or at least in principle those mechanisms employed to constrain the length of prior experience (such as term limits) can be changed, forcing societies to choose between different lengths of (fixed) τ. The USA has chosen a maximum of 8 years for its Presidents,[7] Colombia 4 years. It is therefore useful to consider the impact of alternative τ.

[6] Variation in both τ and ω is also of consequence - but since this is the subject of the following sections of the paper, we defer the relevant discussion.

[7] Strictly 10 years, should a Vice President assume presidential duties prior to being elected as President in his own right.

The difference between the case with free τ and the preceding, is that both N and τ serve as state variables. Thus the objective functional:

$$\begin{aligned} \max! V &= \int_0^{\infty} \left(\left[a + \omega \left(c \ln(\tau) - e^{\delta\tau} \right) \right] N - bN^2 - \alpha \dot{N} - \beta \dot{N}^2 + \left(m\omega - n\omega^2 \right) \right) e^{-\rho t} dt \\ s.t.\ N(0) &= N_0,\ \tau(0) = \tau_0. \end{aligned} \tag{4.1}$$

now gives us the two simultaneous Euler Equations:

$$\ddot{N} - \rho \dot{N} - \frac{b}{\beta} N = \frac{\alpha\rho - a - \omega \left(c \ln(\tau) - e^{\delta\tau} \right)}{2\beta} \tag{4.2}$$

$$\omega N \left[\frac{c}{\tau} - \delta e^{\delta\tau} \right] e^{-\rho t} = 0 \tag{4.3}$$

For any democratic system the case of $N = 0$ is excluded by definition. Thus the τ-Euler is satisfied for:

$$\begin{aligned} \omega &= 0 \\ \delta e^{\delta\tau} &= \frac{c}{\tau} \end{aligned}$$

The case of $\omega = 0$ represents the possibility of prohibiting any candidate from holding prior experience, in which case the length of experience held by candidates, τ, is redundant to the decision problem.[8] This leaves $\omega \neq 0, N \neq 0$, as the only case of interest in determining optimal length of experience for electoral candidates. In this case we require that $\delta e^{\delta\tau} = \frac{c}{\tau}$. Since $\frac{\partial U}{\partial \tau} = \omega N \frac{c}{\tau}$, and $\frac{\partial C}{\partial \tau} = \omega N \delta e^{\delta\tau}$, the implication of the requirement that $\delta e^{\delta\tau} = \frac{c}{\tau}$ is that optimal τ occurs where the marginal utility equals the marginal cost of additional experience in office. Interpretation of the result is straightforward. Society gains net utility from increasing (decreasing) the length of prior experience held by the $\omega \neq 0$ proportion of the candidates standing for office with prior experience, as long as the marginal benefit from prior experience exceeds (is less than) the marginal cost of doing so.

To gain some understanding of the implications of these findings, Figure 1 plots numeric solutions for τ^* for ratios of $c : \delta$ from $1 : 1$ to $100 : 1$, for $\delta = 0.1$. The choice of δ is governed by the wish to keep the impact of abuse of privilege costs moderate, so as to prevent their domination of any benefits that flow from term of service. Thus δ is chosen so as to allow only moderate increases in abuse of office costs in rising τ. Raising $\delta > 0.1$ merely strengthens the conclusions that we outline below. We note in due course the consequence of allowing $\delta < 0.1$.

The point to note here is that the ratio of benefit to cost parameters needs to rise dramatically to justify even moderate increases in the length of prior service that elected officials should hold. To obtain an optimal τ of 4 years, the ratio of benefit to cost parameters must be approximately $6 : 1$. For an optimal τ of 8 years the ratio rises to $18 : 1$. For 12 years the ratio rises further to approximately $40 : 1$, and for 16 years to roughly $80 : 1$. To obtain anything

[8] This is effectively the choice made by Columbia.

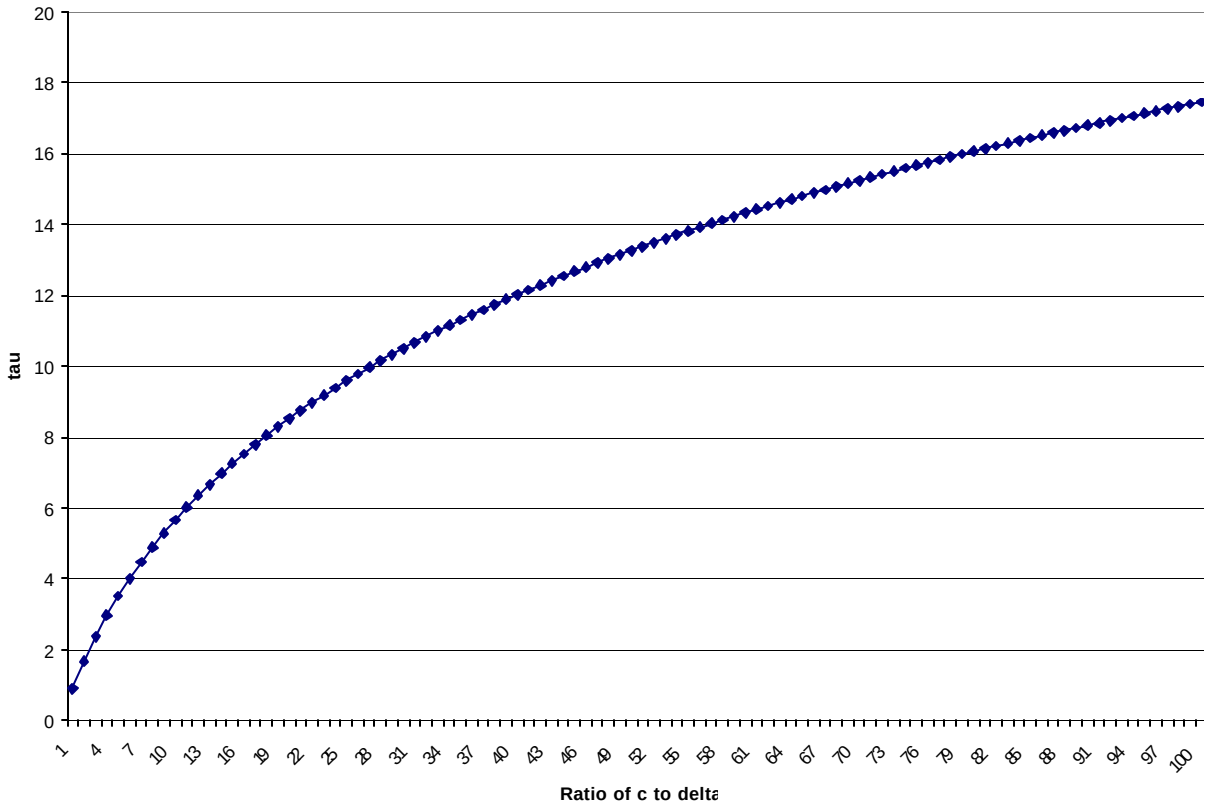

Figure 1: Numeric Solutions for τ^* for $c : \delta$ ratios from 1 to 100, under $\delta = 0.1$.

Ratio	τ^*	τ^*	**Ratio**	τ^*	τ^*	**Ratio**	τ^*
$c:\delta$	$\delta = 0.1$	$\delta = 0.01$	$c:\delta$	$\delta = 0.1$	$\delta = 0.01$	$c:\delta$	$\delta = 0.1$
1	0.91	1.00	80	16.06	49.01	700	31.13
10	5.67	9.13	90	16.79	52.98	800	32.14
20	8.53	16.89	100	17.46	56.71	900	33.05
30	10.50	23.68	200	22.05	85.26	1000	33.86
40	12.02	29.72	300	24.89		10000	52.50
50	13.27	35.17	400	26.97		100000	72.32
60	14.32	40.16	500	28.61			
70	15.24	44.75	600	29.97			

Table 1: Optimal Tau Values under delta=0.1, delta=0.01

close to a life time presidency, say 40 years (just to be sure), requires the ratio of benefit to cost parameters to rise to approximately $2200:1$. To justify a cradle-to-grave term of office (monarchy with the right to succession, for instance) of over 70 years, would require the ratio to rise to approximately $100000:1$. See the summary results in Table 1.

The implication of the analysis is that politicians who claim to bring sufficient benefits to elected office due to their accumulated experience to justify a longer term of service, are unlikely to be correct - at least under the current parameterization of the problem. As a corollary, under the present paramaterization an increase in term of service requires strong evidence that experience benefits exceed the costs from abuse of privilege by a substantial margin. Moreover, successive term of service increases are increasingly demanding of the marginal increases in benefits over costs.

All of this is not to say that long optimal terms of service are impossible. One means of achieving this outcome is to ensure that abuse of privilege costs are negligible. Institutions that render abuse of office impossible would be one means of doing so. This is readily demonstrated by considering the case where we allow $\delta < 0.1$, lengthening optimal term of service. To illustrate, Table 1 considers the case where abuse of privilege cost falls to 10% of that implied by $\delta = 0.1$, namely $\delta = 0.01$. In this case we reach the 8 year optimal term of service with a benefit to cost parameter ratio of approximately $10:1$, the 16 year optimal term of service at $20:1$. Life-time presidents (again defined as a 40-year term of office) emerge at a $60:1$ ratio, while perpetuity emerges at below $200:1$. The burden of proof in favor of increased optimal term of service is clearly less severe than for $\delta = 0.1$. Thus for political systems in which the possibilities of abuse of privilege are reduced by appropriate institutional oversight mechanisms, longer terms of service are indeed feasible. But only where δ is kept "low."

As for the optimal time path and intertemporal equilibrium in the number of electoral candidates, we already know that solution of the Euler equation entails the time path identified by equations 3.6 and 3.7. The conclusions drawn in the previous section of the paper therefore continue to hold. However, one difference

is that since the optimal time path in the number of electoral candidates depends on τ, the solution to the length of experience Euler influences the time path in the number of candidates. In particular:

Lemma 15 *The length of prior experience of candidates that maximizes the number of candidates competing for office in intertemporal equilibrium, will maximize the increase in the number of candidates seeking office in each time period approaching intertemporal equilibrium, and will be satisfied where* $\delta e^{\delta\tau} = \frac{c}{\tau}$.

Proof: The length of prior experience of candidates which maximizes the number of candidates in intertemporal equilibrium, and the growth in the number of candidates in the approach path to intertemporal equilibrium is readily obtained from the relevant first order conditions:

$$\begin{aligned}
\frac{\partial \overline{N}}{\partial \tau} &= \frac{\omega c}{2b}\frac{1}{\tau} - \frac{\omega\delta}{2b}\, e^{\delta\tau} = 0 \\
\frac{\partial \overset{\bullet}{N}^{*}}{\partial \tau} &= -\frac{\omega}{2b}\left(\frac{c}{\tau} - \delta e^{\delta\tau}\right)\frac{1}{2}\left(\rho - \sqrt{\rho^2 + 4\frac{b}{\beta}}\right) e^{\frac{1}{2}\left(\rho+\sqrt{\rho^2+4\frac{b}{\beta}}\right)t} = 0
\end{aligned}$$

both satisfied under $\delta e^{\delta\tau} = \frac{c}{\tau}$. Since:

$$\begin{aligned}
\frac{\partial^2 \overline{N}}{\partial \tau^2} &= -\frac{\omega c}{2b}\frac{1}{\tau^2} - \frac{\omega\delta^2}{2b}\, e^{\delta\tau} < 0 \\
\frac{\partial^2 \overset{\bullet}{N}^{*}}{\partial \tau^2} &= \frac{\omega}{2b}\left(\frac{c}{\tau^2} + \delta^2 e^{\delta\tau}\right)\frac{1}{2}\left(\rho - \sqrt{\rho^2 + 4\frac{b}{\beta}}\right) e^{\frac{1}{2}\left(\rho+\sqrt{\rho^2+4\frac{b}{\beta}}\right)t} < 0
\end{aligned}$$

we are assured of maxima.

Thus the adoption of τ^* from the solution of $\delta e^{\delta\tau} = \frac{c}{\tau}$, ensures that we will have the maximum $\overline{N}$ and $\overset{\bullet}{N}^{*}$. It may seem surprising that the first order condition for a maximum net utility in τ should automatically also serve to also maximize the number of candidates in intertemporal equilibrium. The reason for the coincidence of the two maxima is that in the net social utility function the impact of τ is captured through the term $\omega N\left(c\ln\tau - e^{\delta\tau}\right)$. Thus, as long as the marginal benefit from increasing the length of prior service is positive, it will also pay society to increase the number of candidates standing for office, since this serves to magnify the net gain in utility. Where the marginal benefit from increasing the length of prior experience of electoral candidates exceeds (is less than) the marginal cost, society gains both from increasing (decreasing) the length of prior experience and by increasing (decreasing) the number of candidates (hence ωN).

We can illustrate the findings of this section by reference to Figure 2, which plots the utility and cost functions of the decision problem. The τ-value which corresponds to the length of experience that maximizes $\overline{N}$ is obtained where $\delta e^{\delta\tau} = \frac{c}{\tau}$, that is the slopes of the utility and the cost curves of the problem are equal. We illustrate in Figure 2 by τ^*.

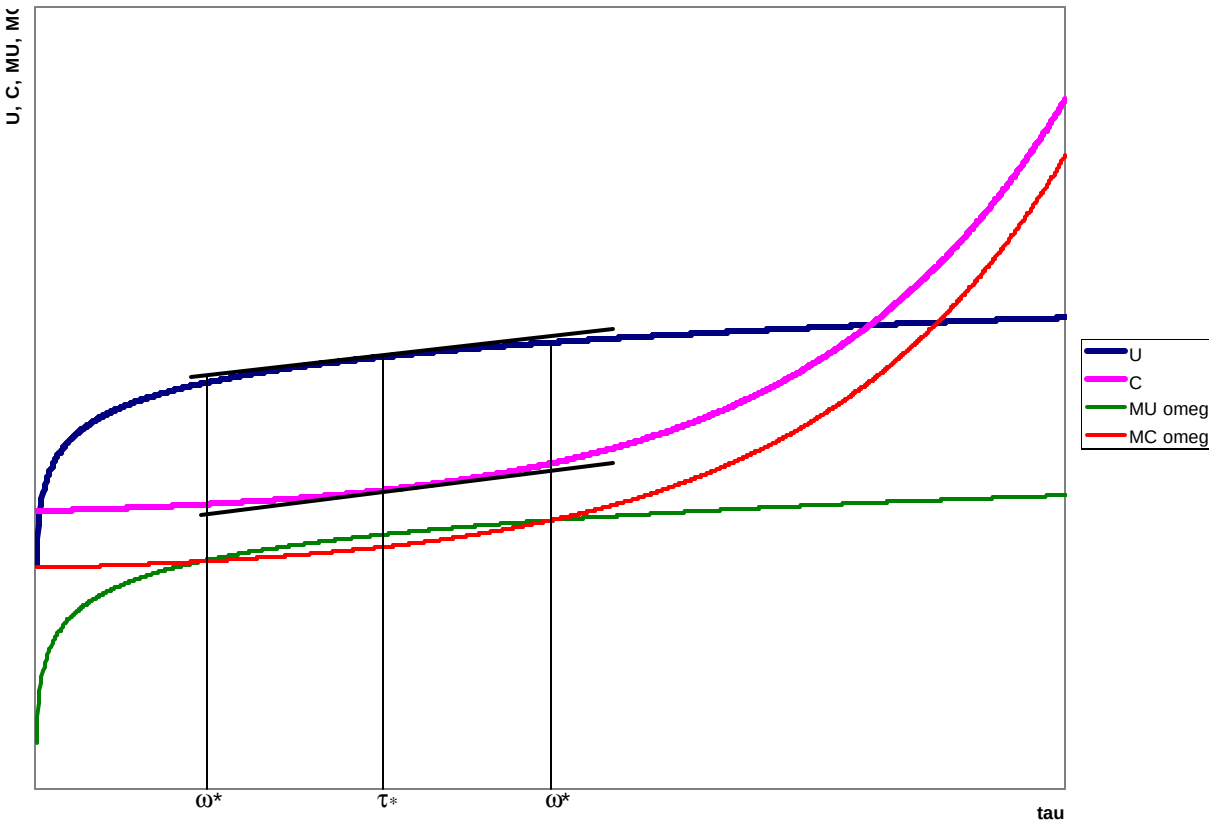

Figure 2: Utility and Cost Functions, and Marginal Utility and Cost Functions in ω.

Lemma 15 implies that $\overline{N}$ and $\overset{\bullet}{N}^{*}$ are maximized only where the experience of candidates as measured by τ is restricted. Allowing the experience in office to grow indefinitely would serve to restrict the number of candidates standing for election in intertemporal equilibrium.

Lemma 16 *In the presence of increased experience amongst electoral candidates, as measured by $\tau \to \infty$, optimality requires $\overline{N} \to 0$.*

Proof: The lower bound of $\overline{N} = 0$. Since $\frac{\partial \overline{N}}{\partial \tau} = \frac{\omega}{2b}\left(\frac{\varepsilon}{\tau} - \delta e^{\delta \tau}\right)$, it follows that $\frac{\partial \overline{N}}{\partial \tau} \gtrless 0$, *if* $\delta e^{\delta \tau} \lessgtr \frac{\varepsilon}{\tau}$. With $\tau \to \infty$, $\lim_{\tau \to \infty}\left(\frac{\varepsilon}{\tau}\right) = 0$, $\lim_{\tau \to \infty}\left(\delta e^{\delta \tau}\right) = \infty$, hence $\lim_{\tau \to \infty} \frac{\partial \overline{N}}{\partial \tau} < 0$, and $\overline{N} \to 0$.

The result may seem counter-intuitive. Explanation rests in the fact that as τ increases, so the costs from abuse of privilege comes to dominate the benefits from term of service. The only response for society is to decrease costs by decreasing the number of candidates standing for office, and who can be a source of the abuse of privilege costs.

Thus the consequence of increasing the length of prior experience of candidates, will have the consequence of *reducing* the number of electoral candidates in intertemporal equilibrium. The implication is of a trade-off between the experience (as measured by τ) and the number of candidates dimensions of the choice set. Increasing the length of prior experience of candidates has the consequence of reducing the choice opportunities that the electorate has in the number of electoral candidates, and vice versa.

5 Allowing Variation in the Proportion of Candidates with Prior Experience in the Dynamic Decision Problem

Finally, suppose that in addition to allowing the term of service to vary, a society also wishes to regulate the proportion of its political class that has prior experience, by $d\omega$. Indeed, since in our model longer term of service increases abuse of privilege cost to the society, it may be better to improve the experiential base of the political class by increasing the proportion of electoral candidates with experience, than it is to increase the length of experience, τ. Of course, this runs the downside of reducing the new blood in the system.

We now have N and τ and ω serving as state variables. Thus the objective functional:

$$\begin{aligned} \max! V &= \int_0^{\infty} \left(\left[a + \omega \left(c \ln(\tau) - e^{\delta \tau} \right) \right] N - bN^2 - \alpha \overset{\bullet}{N} - \beta \overset{\bullet}{N}^2 + \left(m\omega - n\omega^2 \right) \right) e^{-\rho t} dt \\ s.t.\ N(0) &= N_0,\ \tau(0) = \tau_0,\ \omega(0) = \omega_0. \end{aligned} \tag{5.1}$$

gives us the three simultaneous Euler Equations:

$$\overset{\bullet\bullet}{N} - \rho \overset{\bullet}{N} - \frac{b}{\beta} N = \frac{\alpha\rho - a - \omega\left(c \ln(\tau) - e^{\delta \tau}\right)}{2\beta} \tag{5.2}$$

$$\omega N\left[\frac{c}{\tau}-\delta e^{\delta\tau}\right]e^{-\rho t} = 0 \tag{5.3}$$

$$\left[N\left(c\ln(\tau)-e^{\delta\tau}\right)+m-2n\omega\right]e^{-\rho t} = 0 \tag{5.4}$$

Rearrangement and substitution of 5.4 into 5.3 requires:

$$N\left(\frac{N\left(c\ln(\tau)-e^{\delta\tau}\right)+m}{2n}\right)\left(\frac{c}{\tau}-\delta e^{\delta\tau}\right)=0 \tag{5.5}$$

Where $\omega \neq 0$, the requirement is then that $\frac{c}{\tau}-\delta e^{\delta\tau}=0$, providing the set of solutions for τ^* derived under section 4 above, with the marginal interpretation that has already been discussed. In particular, optimal experience for candidates obtains where the marginal return matches the marginal cost of the experience. The implication is also that with a rising $c:\delta$ ratio, optimal τ^* rises.

In steady state the solution for ω^* under $\omega \neq 0$ then requires that:

$$\omega^*=\frac{\left(c\ln(\tau^*)-e^{\delta\tau^*}\right)(a-\alpha\rho)+2mb}{4nb-\left(c\ln(\tau^*)-e^{\delta\tau^*}\right)^2} \tag{5.6}$$

where τ^* is determined by the solution to $\frac{c}{\tau}-\delta e^{\delta\tau}=0$. However, since $\omega^*(N(t))$, ω^* will itself be time-varying in the approach to the intertemporal equilibrium value determined by $\overline{N}$.[9] Thus we obtain $\omega^*(t)$ from:

$$\omega^*(t)=\frac{\left(\frac{m}{c\ln(\tau^*)-e^{\delta\tau^*}}\right)+\left(\frac{a-\alpha\rho}{2b}\right)+\left(N_0-\frac{a-\alpha\rho}{2b}\right)e^{\frac{1}{2}\left(\rho+\sqrt{\rho^2+4\frac{1}{\beta}}\right)t}}{\left(\frac{2n}{c\ln(\tau^*)-e^{\delta\tau^*}}\right)+\left(\frac{c\ln(\tau^*)-e^{\delta\tau^*}}{2b}\right)\left(e^{\frac{1}{2}\left(\rho+\sqrt{\rho^2+4\frac{1}{\beta}}\right)t}-1\right)} \tag{5.7}$$

Where by contrast $\omega=0$ (the Columbian case), it follows immediately that $\tau=0$. Equally, it also follows that in general $\tau=0$ is a sub-optimal solution, since in steady state τ^* under the condition that $\omega=0$, will obtain from the solution of:

$$c\ln(\tau)-e^{\delta\tau}=\frac{-2mb}{a-\alpha\rho} \tag{5.8}$$

and in approach to steady state from the solution of:

$$c\ln(\tau)-e^{\delta\tau}=\frac{-m}{\left(N_0-\frac{a-\alpha\rho}{2b}\right)e^{\frac{1}{2}\left(\rho-\sqrt{\rho^2+4\frac{1}{\beta}}\right)t}+\frac{a-\alpha\rho}{2b}} \tag{5.9}$$

Since in both instances $\tau=0$ is precluded as a solution, $(\tau,\omega)=(0,0)$ cannot be an optimum.

The social optimum thus requires both $\omega^*>0$ and $\tau^*>0$.

Since optimal (τ,ω) pairings under $\omega\neq 0$ are available only numerically, we explore the steady state optima over a range of possible parameter values.

The most immediate implication is a confirmation of the strong non-linearities in the solutions for ω^* that are evident from the analytical expression 5.6. Note

[9] Note that by contrast τ^* is *not* time-varying.

that the non-linearities apply to all of the a, b, m, n, α and ρ dimensions, as illustrated in Figures 3 through 8. The second implication is that the non-linearities are severe. Small changes in parameter values can bring about dramatic changes in optimal ω^* - often from 1 to 0, or vice versa. Again, this is true for all of the parameter dimensions. Third, for at least some parameter values there exist no optimal (τ^*, ω^*) pairings. Specifically, for substantial ranges of parameter values the implied $\omega^* = 0$, which we have already identified as requiring the impossible condition that $\tau^* = 0$.

The significance of these implications for electoral systems are potentially profound. Small changes in social conditions, as reflected in changes in the parameter values of the model, may bring about strong changes in the optimal (τ^*, ω^*) pairings. Now provided only that political systems change slowly in the τ and ω dimensions, it follows that even relatively small changes in social conditions (as reflected in a, b, m, n, α and ρ) may leave the society with political candidates with lengths of experience τ, and a political class with a proportion of new blood $(1 - \omega)$ that the society no longer considers optimal, even though both dimensions might have been optimal only very recently.

Figures 3 through 8 also illustrate that where political systems change not only slowly, but do so in marginal increments rather than in the form of dramatic systemic shifts (as is the case for most parliamentary democracies), the required shift in the optimal ω^* may be so large that the political system will struggle to achieve the change.

Hence social dissatisfaction with the political classes can readily emerge for only marginal social changes. Second, since optima may come to be located far away from prevailing status quo positions (which may have been optimal), the level of social dissatisfaction may prove to be deep (since the divergence between practice and optima is large). Third, where political systems are slow to change, the social dissatisfaction may prove to be protracted.

Even more dramatically, for at least some parameter values societies will not have optimal (τ^*, ω^*) pairings at their disposal. The $(\tau^*, \omega^*) = 0$ are not feasible as utility maximizing alternatives - and yet for some parameter values the $\omega^* = 0$ is binding. The implication is that some societies may well be constrained to sub-optimality in the τ- and ω-dimensions. The consequence is that dissatisfaction with the political class and system will be endemic, in the sense that the dissatisfaction cannot be eliminated: there simply is no optimum which is available to the society.[10] No amount of policy intervention can resolve social disaffection under these circumstances.

What is important about these findings is that it is often assumed that the source of disaffection with political processes arises from social choice problems (poor preference aggregation), or public choice problems (government failure of some form). Here we have demonstrated that it is feasible that the very choice set that voters face in political systems can be the source of the disaffection.

[10] Even more worrying is the fact that societies can move from a state where utility maximization in τ, ω, is feasible, to one where it is not feasible over very small variations in the parameter values of the model.

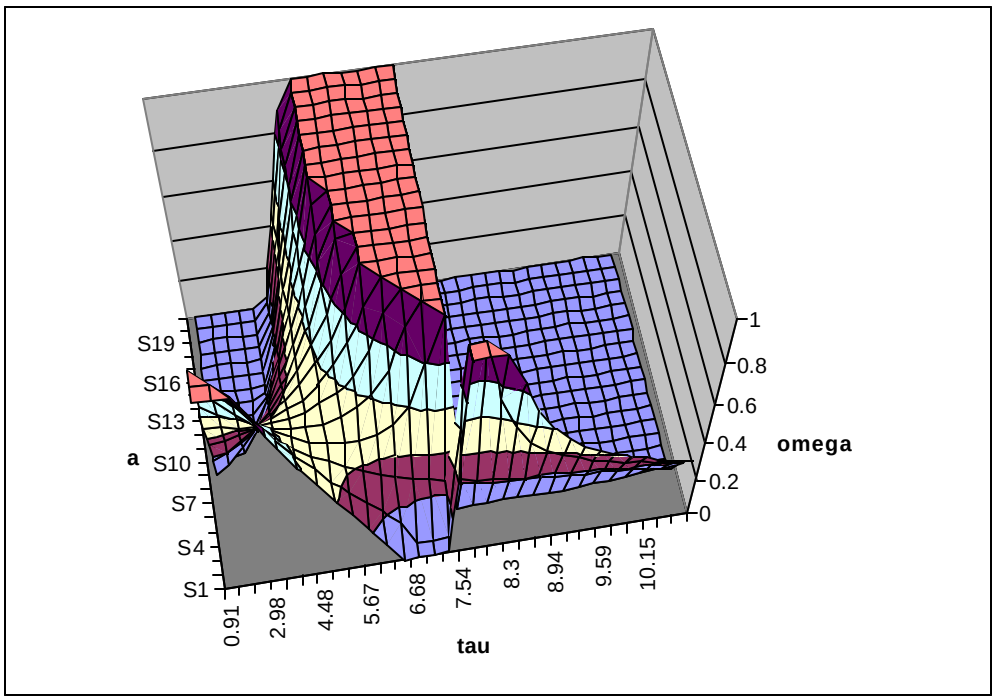

Figure 3: ω^* under $0.1 \leq a \leq 10$, for relevant τ^* values.

Moreover, it is apparent that the disaffection may occur precipitously for very small social changes, prove severe, protracted, and endemic.

As for the optimal time path and intertemporal equilibrium in the number of electoral candidates, we already know that solution of the Euler equation entails the time path identified by equations 3.6 and 3.7. However, once again since the optimal time path in the number of electoral candidates depends on both τ and ω, the optimal time path in the number of candidates is influenced by the simultaneous solution to the τ- and ω-Eulers. The implication is that the N^* and $\overline{N}$ solutions are subject to the same precipitous changes that τ^* and ω^* are subject to.

Since $\frac{c}{\tau} = \delta e^{\delta\tau}$, Lemma 15 continues to hold.

In addition:

Lemma 17 *Steady state candidate numbers and the optimal time rate of change of candidate numbers will rise in the proportion of candidates with prior experience where* $e^{\delta\tau} < c\ln\tau$*, and fall where where* $e^{\delta\tau} < c\ln\tau$*.*

Proof: Since:

$$\frac{\partial\overline{N}}{\partial\omega} = \frac{c\ln\tau - e^{\delta\tau}}{2b} \gtrless 0, \; if \; c\ln\tau - e^{\delta\tau} \gtrless 0$$

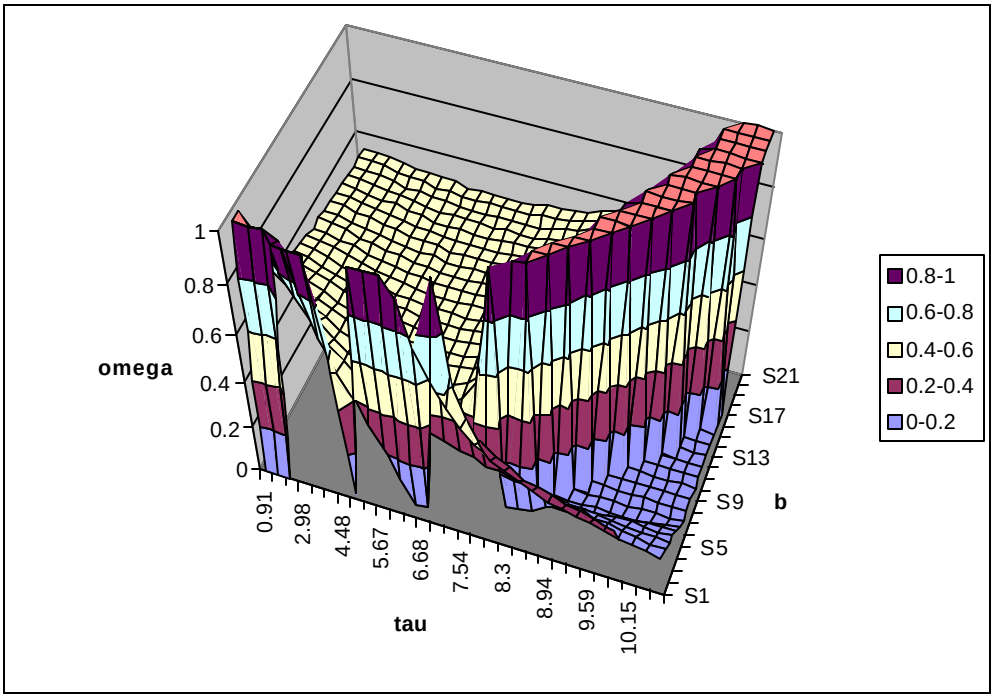

Figure 4: ω^* under $0.1 \leq b \leq 10$, for relevant τ^* values.

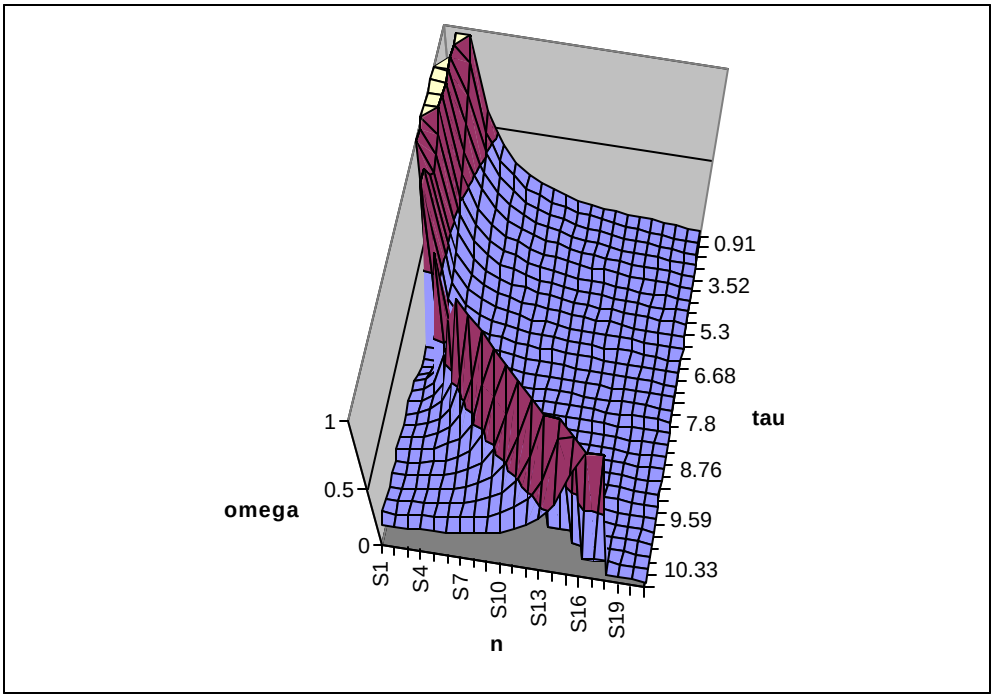

Figure 5: ω^* under $0.1 \leq n \leq 10$, for relevant τ^* values.

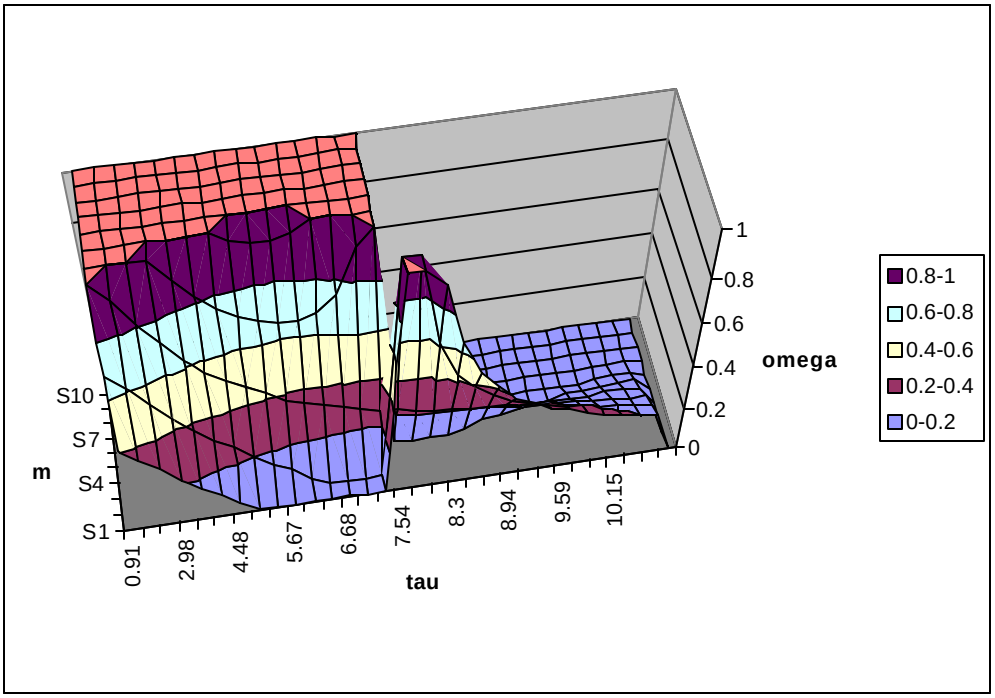

Figure 6: ω^* under $0.1 \leq m \leq 4.5$, for relevant τ^* values.

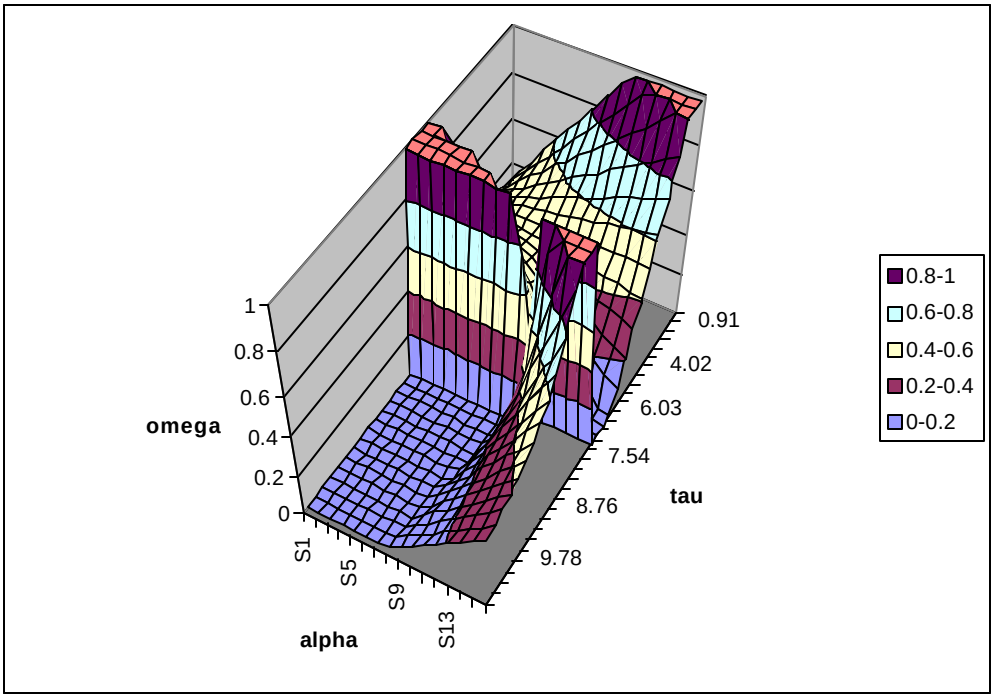

Figure 7: ω^* under $0 \leq \alpha \leq 20$, for relevant τ^* values.

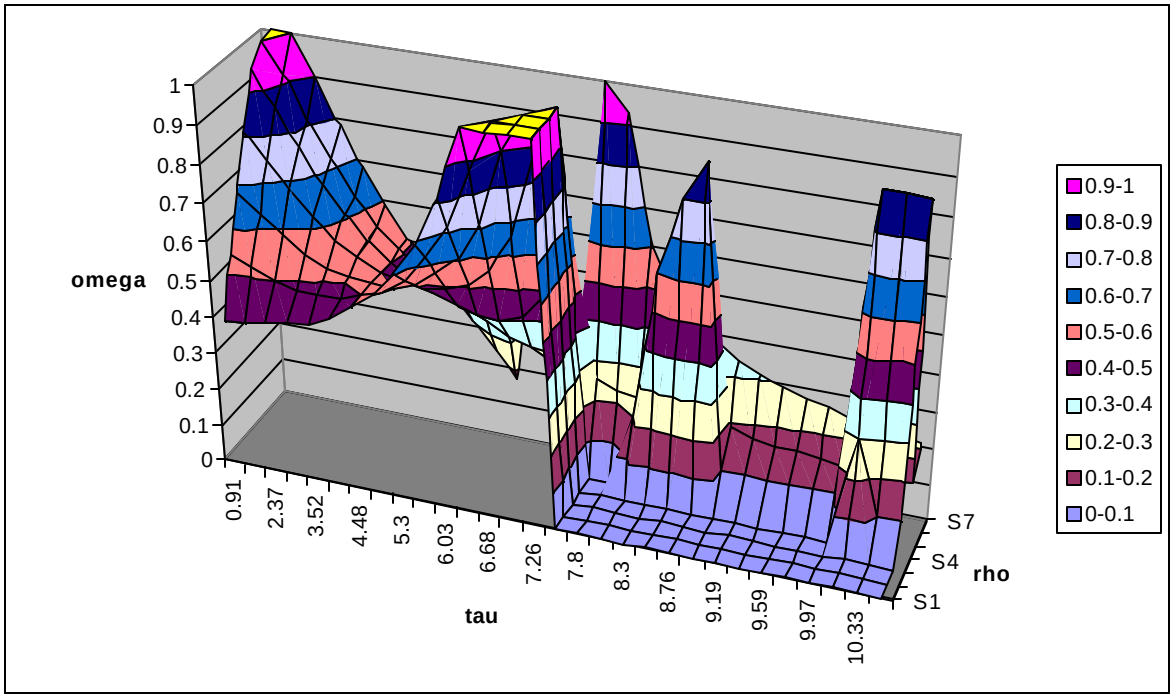

Figure 8: ω^* under $0.01 \leq \rho \leq 0.12$, for relevant τ^* values.

$$\begin{aligned}\frac{\partial \overset{\bullet}{N}^{*}}{\partial \omega} &= -\left(\frac{c\ln\tau - e^{\delta\tau}}{2b}\right)\frac{1}{2}\left(\rho - \sqrt{\rho^2 + 4\frac{b}{\beta}}\right)e^{\frac{1}{2}\left(\rho+\sqrt{\rho^2+4\frac{b}{\beta}}\right)t} \\ &\gtrless 0,\ if\ c\ln\tau - e^{\delta\tau} \gtrless 0\end{aligned}$$

The reason for the result is straightforward: in the net social utility function the impact of ω which is mediated through the number of candidates N, is captured through the term $\omega N\left(c\ln\tau - e^{\delta\tau}\right)$. Thus, as long as the marginal benefit from increasing the proportion of candidates with prior service is positive (i.e. $c\ln\tau - e^{\delta\tau} > 0$), it will also pay society to increase the number of candidates standing for office, since this serves to magnify the net gain in utility. Where the marginal benefit from increasing the proportion of candidates with prior experience exceeds (is less than) the marginal cost, society gains both from increasing (decreasing) the proportion of candidates with prior experience and their number.

6 Conclusion: Of Plains, Crags and Precipices

We have examined societies with three different electoral systems. One where both fixed terms of service applied, and the proportion of electoral candidates with prior experience was fixed. Two successive electoral systems considered freed both the length of prior experience, and the proportion of candidates with prior experience.

Two core results emerge from the analysis. The first is that the optimal number of candidates standing for election even in the relatively idealized world that our model represents, is not indefinitely large. While there are benefits that accrue to having a larger choice, the optimal number of candidates is strictly finite. This result is invariant to any choices made concerning the experiential base the electoral candidates bring to the electoral process.

The second core feature of the results to emerge concerns the experiential base of the candidates seeking election, rather than their number. To justify an increase in the optimal length of prior experience requires strong increases in the ratio of benefits that accrue from additional experience to the cost of abuse of privilege.

The bottom line to emerge is that the optimal choice set of candidates in elections places constraints on both the *number* of candidates seeking selection, as well as on the *experiential base* of such candidates as do stand for election.

One condition under which an increase in the length of prior experience is more readily justified is where the cost associated with abuse of privilege is negligible ($\delta \to 0$). This would require the development of appropriate formal (legal and constitutional) and informal (civil society) institutions that ensure that abuse of office costs remain low. A feasible interpretation of this result is that mechanisms such as term limits are justified where democratic oversight institutions are new and relatively fragile, or where independent watch-dog functions by formal or informal institutions are not well developed. The crucial point

is that societies have a choice between designing institutions that limit the impact of abuse of priviledge (the δ-parameter), or of limiting the time politicians may spend in office. Where a society does not have the institutions that control abuse of priviledge, the only recourse is something like term limits. But equally, where a society has mechanisms that ensure probity in public office, the need to curb the length of time spent in office diminishes also.

Hence the short answer to the concrete questions with which we began: It is very likely that we want to see (considerably) less of Robert Mugabe. The case for Ronald Reagan is easier to make - though throughout the burden of proof on all who propose long periods of service for political classes is heavy.

But perhaps the most startling set of results emerges under the case in which societies optimize in all three dimensions of the decision problem: the number of candidates standing for election, the length of prior experience, and the proportion of candidates with prior experience. A number of dramatic results emerged. Strong non-linearities ensured that even very small changes in the parameters that characterize a society can generate very strong changes in the optimal experiential base of the political class (as measured by the (τ, ω) pairing). Since for the most part political systems are slow to change, and do so predominantly by means of small incremental changes, dissatisfaction and severe dissatisfaction with political systems is readily explained in the current model as the result of very small social changes. Finally, since we have shown that optimal (τ, ω) pairings may simply not exist for a relatively wide range of parameter values, societies may be condemned to suboptimality even should the political system prove to be amenable to change, and both rapid and dramatic change. Optimal experiential bases for the political class are simply not available, rendering disaffection endemic to the political system.

The literature often assumes that the source of disaffection with political processes arises from social choice problems (poor preference aggregation), or public choice problems (government failure of some form). Here we have demonstrated that it is feasible that the very choice set that voters face in political systems can be the source of the disaffection. Moreover, it is apparent that the disaffection may occur precipitously for very small social changes, prove severe, protracted, and endemic.

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