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Abstract

Using the method of optimal control, when an incumbent politician derives utility from voting support and dis-utility from budgetary deficit, the equilibrium time paths of both voting support and budgetary deficit are characterized in a finite time horizon under complete information. The incumbent politician may be an opportunist, in that she/ he is interested in garnering votes for herself/ himself, and manipulates budgetary deficit to achieve this, or else she/ he may be partisan, that is, characterized by heterogeneous preferences, reflecting preferences for specific economic policies. The citizen-voters vote for the opportunist as well as the partisan incumbent. However, they reject the same when there is a sufficiently strong anti-incumbency in the opportunist case. The level of voting support obtained in case of both opportunist and partisan is found to be positive and rising over time, but running the budgetary deficit will be costlier for the economy in the former case than the latter. That is, per unit votes garnered by raising the budgetary deficit as compared to the benchmark deficit are lower when the incumbent is an opportunist than when she/ he is partisan.

JEL CLASSIFICATION: D72, P16, P35

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1. Introduction

Drawing upon the psychological analyses in the realm of neuroscience, Westen (2007) derives from the brain scanning results that; ".... the political brain is an emotional brain. It is not a dispassionate calculating machine, objectively searching for the right facts, figures and policies to make a reasoned decision...." He arrives at this conclusion by analyzing political advertisements (adverts) on television that, while banned in the United Kingdom (UK), are widely used in the United States of America (USA). He claims that these are significant budgetary items on which candidates spend millions of dollars. The author concludes that the "Republicans understand what the philosopher, David Hume, recognized three centuries ago: that reason is a slave to emotion, not the other way around". The politicians play the emotive psychological strategies based on caste, race, religion, economic policies etc. The voters' preferences may be defined over some necessities, which are enslaved to incumbent's opportunism that voters may fail to understand. Among these, the economic policy making is one of the most talked about and used opportunistic tools for an incumbent.

In India, before the general elections of 2009, the central government's gross fiscal deficit to Gross Domestic product (GDP) ratio was 5.99% and 6.46% in the years 2008-09 and 2009-10 respectively, which reduced to 4.79% in 2010-11. However, it was at a slightly lower value of 4.77% in 2013-14 and 5.20% in 2012-13 as compared to the previous general election year. Moreover, the data for 2013-14 is a budget estimate, which is very likely to rise from the current value. This was a clear indication on the part of the incumbent about his/her cyclical fiscal behavior, targeting the general election of 2014.

Although, the notion of political business cycle was propounded by Kalecki (1943), it was re-invented by Nordhaus (1975) and Hibbs (1977). Nordhaus (1975) considered an opportunistic pre-electoral manipulation of economic policies (that is, inflation-unemployment cycles) by the incumbent to raise the chances of getting re-elected, whereas, Hibbs (1977) explained the post-electoral cycles due to varied macroeconomic goals of policy makers, popularly known as partisan cycles. Both of these first-generation papers assumed a seemingly irrational behavior of the citizen-voters and relied on monetary policy as the driving force. Alongside, there was the emergence of several seminal empirical papers, such as those by Kramer (1971), Tufte (1975) and Fair (1978), which examined the economic determinants of US congressional voting. In order to counter the conceptual criticisms meted out to this early strand of literature that utilized the notion of irrationality of voters, and reliance on monetary policy for electoral manipulation, there emerged the second-generation models in the mid-80s. In this category fall the seminal papers by Cukierman and Meltzer (1986), Rogoff and Sibert (1988), Rogoff (1990) and Persson and Tabellini (1990) that deal with an opportunistic model in a rational expectations framework. Also, in the 1980s and 1990s, a new game theoretic approach evolved to understand the macroeconomic behavior. These models utilized the notion of rational expectations that restricted the magnitude of opportunism toward exploiting the Phillips curve. In the opportunistic model with rational expectations, it is assumed that the incumbent cannot fool the voters time after time, and the voters understand the trade-off between unemployment and inflation, and they might even punish the incumbent.

Persson and Tabellini (1990) introduced the notion of competency in the Nordhaus (1975) version of the Phillips curve. These authors focused on the competency of the candidate along with the asymmetry of information on the observation of inflation and output. For instance, they stated that, "one candidate may be particularly able (or unable) to cope with a shock in the price of oil, or to enact the effective labor market legislation, or to negotiate with trade unions" (Persson and Tabellini, 1990. pp. 80). The political parties behave opportunistically to display their competency in the election. The informed guess by voters is if the policymaker was competent yesterday, she will be competent even tomorrow. A competent policymaker expands the economic activity (pre-electoral boom) immediately before the election, and voters observed this to re-elect the policymaker. The political business cycle will exist with one type of policymaker namely-competent one and voters voting will be based on its competency. This model is silent about the post-electoral recession. Rogoff and Sibert (1988) and Cukierman and Meltzer (1986) together propose the model of competency with the government budget and not the Phillips curve. The government expenditure is financed by lump-sum taxes and seigniorage revenue. The competency term is the additional factor in the government's budget constraint. Rogoff and Sibert (1988) derive that each type of policymaker, with the exception of the least competent one, distorts the pre-electoral fiscal policies. That is, in the pre-electoral period, the possibility of lower taxation and higher deficit or higher inflation (resulting from seigniorage) could exist. Rogoff (1990) sets up a model similar to Rogoff and Sibert (1988), where government expenditure and public investment are depicted as a function of lump-sum taxes and competency. Under these models, a politician has better information about his own level of competence than do voters. Voters cannot observe competence directly nor can they immediately infer it from fiscal policy because they do not observe all government expenses. In fact, voters use the part of the government spending they do before an election to make inference about post-electoral competence. Consequently, it results in an incentive for an incumbent who is contesting to be re-elected and also increase spending on those goods which are more visible to voters before the election. That is, under asymmetry of information on the nature of the policymakers, there exists a separating equilibrium, where a competent incumbent signals her executive abilities by reducing public investment below the full information efficient level, and conversely, the competent incumbent also increases the government expenditure above the efficient level. Hence, the competent policymaker programmes the Political Budget Cycle (PBC) that promotes the government to spend more on visible public goods, together by reducing taxes. Cukierman and Meltzer (1986) propose another competency-based model consistent with pre-electoral policy distortion. Even in this model authors explain that, due to asymmetry of information between the government and voters, the incumbent has an incentive to distort economic policy in the electoral period.

The opportunistic PBC from the first to the second-generation models differed in terms of moving from the assumption of adaptive expectations to rational expectations. The rational opportunistic model contrasts with the shortcomings of the models with adaptive expectations. However, with a similar approach, the first-generation model provides better room to exploit the Phillips curve under irrational citizen-voters. While the major implications are similar, the two differ in their growth predictions. In the adaptive expectations framework, monetary and fiscal policy are found to be more effective in creating the desired macroeconomic cycles as compared to the rational expectations framework, which is mainly a consequence of irrationality of voters. So, the electoral effects tend to persist for a longer duration in the traditional models than the rational expectations version. In the traditional (adaptive expectations) model, every government (partisan or opportunistic) is identical in behavior, whereas in the rational expectations version, incumbents often behaved less opportunistically and might even follow the optimal policy rule for the economy.

In the partisan model, rational expectations and price rigidities have been introduced by Alesina (1987) after widespread criticism was meted out to the exploitable Phillips curve-based monetary model of political business cycle. Alesina (1987) considered rational expectations with partisan post-electoral political cycles (as against the adaptive expectations) in his earlier work. Alesina's rational partisan model concludes that in the first half of the elected term, unemployment is lower and inflation higher under the left-wing government than the right-wing party. Since, expectations are formed before the election in the first half term, so after the election, the left-wing win implies higher inflation than anticipated while the right-wing victory means inflation is lower than expected. Moreover, there is no economic fluctuation in the second half term because the identity of the party in power is revealed as the wage contracts are signed. In contrast, Hibbs (1977) states that the overall economic activity is higher in the left-wing government than the right-wing government in their respective administrative span. Alesina (1987) also faces a number of criticisms. The concept of the Phillips curve talks about the implicit contract of the workers in first term under uncertainty of election outcome. Garfinkel and Glazer (1994) suggests that the problem of uncertainty could be resolved by simply postponing the contract by workers till the election outcome is known. Thus, there is a clear tendency towards delaying the contract until after the election results, because expectations will be formed based on which type (left- or right-wing) government comes to power.

Interestingly, there exists select literature that examines the possibility of merging of both -- opportunistic and partisan -- versions of the model. Alesina and Rosenthal (1995) have made some effort in this direction to merge the concept of competency with partisan behavior of the government. Authors say that, a partisan and opportunist incumbent might be compatible with each other. In fact, Frey and Schneider (1978) suggests that the partisan politician becomes opportunist when the election time approaches and they are in danger of losing the election, whereas they go for their partisan goals when they are electorally confident. Moreover, the opportunistic behavior of different partisan politicians may be different. Adjusting oneself toward the ``middle" might be the most effective opportunist policy for a partisan politician. Thus, we cannot ignore the possibility of partisan politician to play a mixed role - being an opportunistic when in the office, and being partisan when outside the office. Following varying criticisms of the opportunistic and partisan models, Drazen (2000) proposes a new model of political budget cycle, based on Rogoff (1990). Drazen (2000) extends the model by including both monetary and fiscal policy with opportunistic and forward looking citizen voters to capture the PBC, popularly known as "Active-Fiscal Passive-Monetary (AFPM)". In this case, the incumbent government can directly influence the fiscal policy, but monetary policy is controlled by the monetary authority as an independent central bank. However, monetary authority can be exploited to accommodate fiscal decisions of the incumbent. Drazen (2000) also presents the non-parametric empirical evidence in favor of AFPM.

In fact, most of the recent research work tries to explain the economic cycles by including the fiscal policy in the model. The presence of government debt due to political considerations has been well documented (see, for instance, Alesina and Perotti, 1995; Drazen, 2000; Persson and Tabellini, 2000). Drazen and Eslava (2010) and Brender and Drazen (2013) analyze the composition of government spending (rather than aggregate spending) as used by the incumbent as an electoral tool. Their findings state that rational voters support the opportunist government which, in fact, incurs the targeted expenditure in the economy prior to the election. Brender and Drazen (2013) also find that an established democracy changes the composition more frequently than the new democracy. It is within this body of research that our paper aims to extend the models of opportunistic and partisan politics by incorporating the time-dynamics of voting support and budgetary deficit, just prior and post the election period, orchestrated through changes in fiscal policy. In a complete information framework, we look at the time path of both opportunistic and partisan government using budgetary deficit as the policy tool.

The most important motivating factor underlying this paper is the following observed empirical regularity - why are most countries today positively skewed toward, higher fiscal deficit? In 2010, of the 110 countries in our sample, a mere 14.54%, and in 2011, out of 103 countries, only around 19.41% were in cash surplus; the rest were running a deficit (World Bank Database).[4] The leading regions with at least 5%

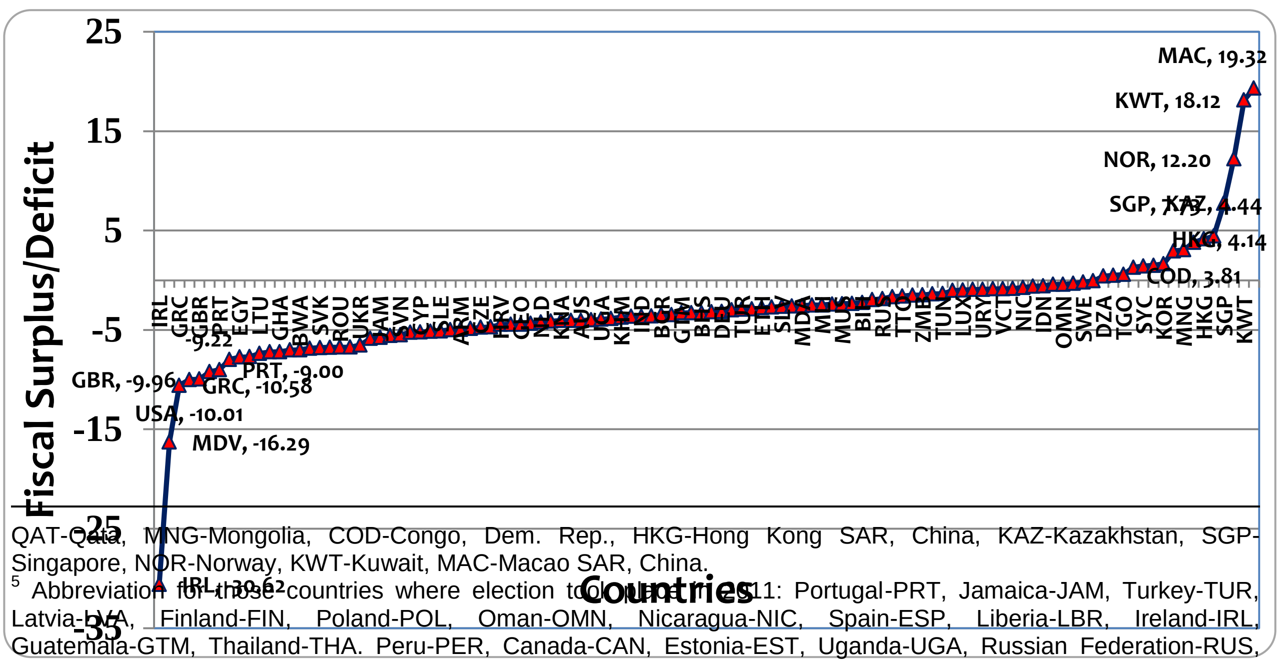
[4]Abbreviation of the Countries used in Figure *1*: IRL-Ireland, MDV-Maldives, GRC-Greece, USA-United States, GBR-United Kingdom, ISL-Iceland, PRT-Portugal, BRB-Barbados, EGY-Egypt, Arab Rep., LBN-Lebanon, LTU-Lithuania, LKA-Sri Lanka, GHA-Ghana, FRA- France, BWA- Botswana, LVA-Latvia, SVK- Slovak Republic, JPN-Japan, ROU-Romania, POL-Poland, UKR-Ukraine, KEN-Kenya, JAM-Jamaica, JOR-Jordan, SVN-Slovenia, ESP-Spain, CYP-Cyprus, MYS-Malaysia, SLE-Sierra Leone, PAK- Pakistan, ARM- Armenia, KGZ-Kyrgyz Republic, CZE-Czech Republic, ISR-Israel, HRV-Croatia, BFA-Burkina Faso, GEO-Georgia, CRI-Costa Rica, NLD-Netherlands, COL-Colombia, KNA-St. Kitts and Nevis, ZAF-South Africa, AUS-Australia, SRB-Serbia, UGA-Uganda, ITA-Italy, KHM-Cambodia, MLT-Malta, IND-India, HUN-Hungary, BGR-Bulgaria, PHL-Philippines, GTM-Guatemala, AUT-Austria, BHS-Bahamas, The, BEL-Belgium, DEU-Germany, HND-Honduras, TUR-Turkey, DOM-Dominican Republic, ETH-Ethiopia, NZL-New Zealand, SLV-El Salvador, FIN-Finland, MDA-Moldova, DNK-Denmark, MLI-Mali, GRD-Grenada, MUS-Mauritius, MAR-Morocco, BIH-Bosnia and Herzegovina, CAN-Canada, RUS-Russian Federation, BRA-Brazil, TTO-Trinidad and Tobago, BLR-Belarus, ZMB-Zambia, NPL-Nepal, TUN-Tunisia, BEN-Benin, LUX-Luxembourg, BGD-Bangladesh, URY-Uruguay, LBR-Liberia, VCT-St. Vincent and the Grenadines, LAO-Lao PDR, NIC-Nicaragua, THA-Thailand, IDN-Indonesia, CHL-Chile, OMN-Oman, AZE-Azerbaijan, SWE-Sweden, EST-Estonia, DZA-Algeria, PER-Peru, TGO-Togo, PRY-Paraguay, SYC-Seychelles, AFG-Afghanistan, KOR-Korea, Rep.,

deficits in 2010 and 2011 were North American, high income OECD members, and the East Asian Pacific countries. The below 5\% countries were the Euro Area, South Asia, lower middle income Europe and Central Asia. Figure 1 shows the fiscal surplus/ deficit in the different countries ranked from the highest deficit to the highest surplus (in percent).

Figure 2 shows the election year and year before fluctuations in fiscal deficit from the average fiscal deficit in the tenure. The year of election is 2011, where the form of election are - general assembly, assembly and presidential in the selected countries. In Figure 2, the dark blue line depicts the deviation of the election year deficit from the average of the last five years, including the election year, fiscal deficit. Similarly, the dotted line is the immediate year before the election in terms of the deviation of the budgetary deficit from the average of last four years including the reference year. As can be seen, the deviation of the budget deficit from the average in a year before to election points toward fiscal manipulation by spending more in the years close to the election year. In both, the election year and the year before it, in most of the cases countries are running a higher deficit as compared to the average. Interestingly, the incumbent attempts to spend more on various heads in the year before the election than the election year itself. The calculated gestation lag of the expenditure on public goods can mobilize substantial voting support in favor of the incumbent in the next election.[5]

Figure 1: Fiscal Surplus/Deficit in the World Economy

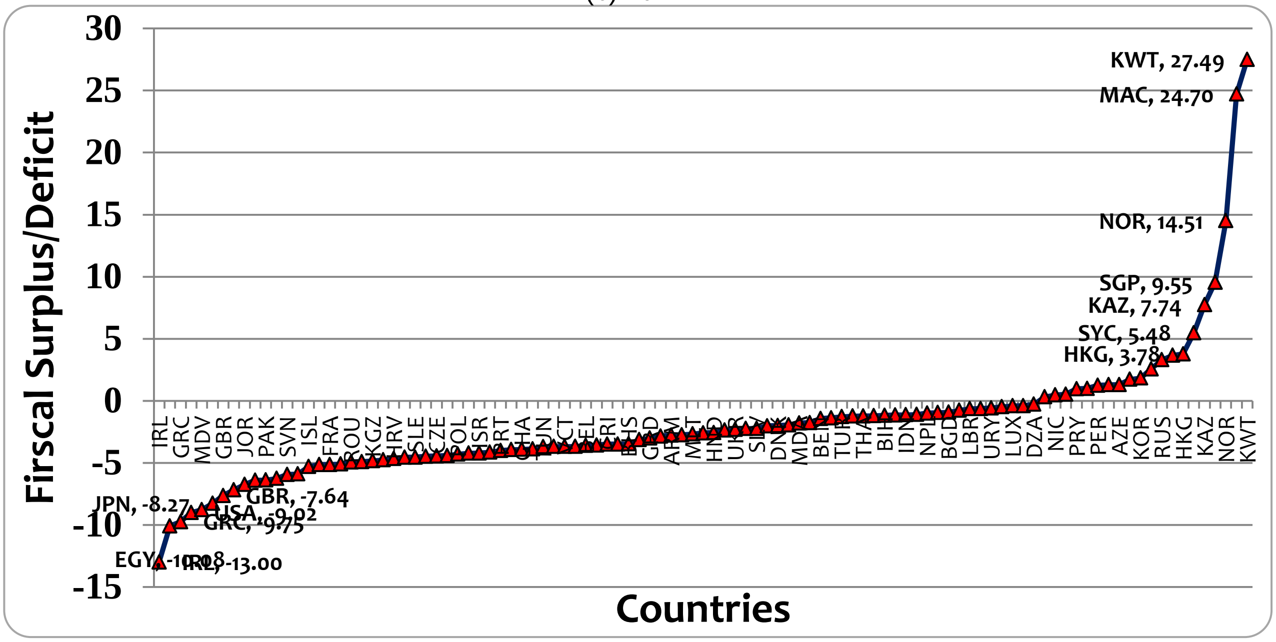
(a) 2010



QAT-Qata, MNG-Mongolia, COD-Congo, Dem. Rep., HKG-Hong Kong SAR, China, KAZ-Kazakhstan, SGP-Singapore, NOR-Norway, KWT-Kuwait, MAC-Macao SAR, China.

[5] Abbreviation for those countries where election took place in 2011: Portugal-PRT, Jamaica-JAM, Turkey-TUR, Latvia-LVA, Finland-FIN, Poland-POL, Oman-OMN, Nicaragua-NIC, Spain-ESP, Liberia-LBR, Ireland-IRL, Guatemala-GTM, Thailand-THA. Peru-PER, Canada-CAN, Estonia-EST, Uganda-UGA, Russian Federation-RUS, Denmark-DNK, Croatia-HRV, Bulgaria-BGR, Tunisia-TUN, Singapore-SGP, Kyrgyz Republic-KGZ, Slovenia-SVN, Seychelles-SYC, Egypt, Arab Rep.-EGY, Kazakhstan-KAZ, Morocco-MAR, Cyprus-CYP, New Zealand-NZL .

(b) 2011

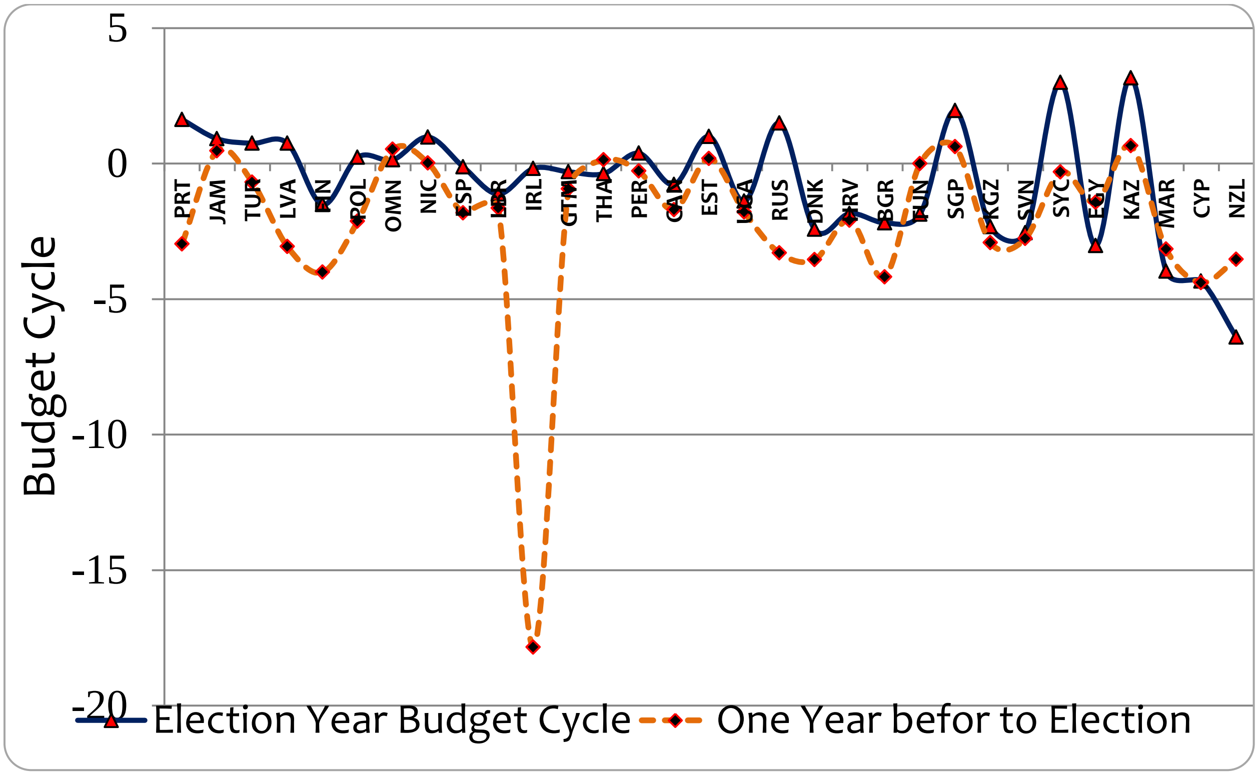


Source: World Bank

The most general way of analytically modeling economic decision making is driven by a benevolent social planner criterion, where an incumbent politician tries to distribute the government expenditure with its relative importance required for the balance economic growth. However, in real economies, the decision making process of the government is not free from political motivations. Often, a government can opportunistically expand public spending before the election to attract voters.

Alternatively, it may be characterized by partisan behavior in which different politicians have varied fiscal preferences, indicative of heterogeneous preferences of voters. In either case, since the notion of fiscal deficit is not easily understood by the common citizen-voter, she/ he may often run into “fiscal illusion". Initially, the concept of balanced budget has been well accepted by the economist, but in recent Keynesian economies, fiscal deficit has been used as a driving force for higher growth. In fact, in today's globalized world, the number of countries running into fiscal deficit is higher than the number of countries running a surplus. Furthermore, not only do countries continually run into a deficit, in many cases, the governments artificially create a higher deficit just before the election year.

Figure 2: Budget Cycle in the World Economy in 2011



Source: world Bank

In view of the above discussion, the paper utilizes an optimal control model of an incumbent government that is politically motivated. The government maximizes its utility that is a weighted sum of utility from voting support and disutility from budget deficit, where the latter is implied by a large enough government expenditure on (may be) populist economic policies (which are not explicitly modeled). The economy consists of a continuum of citizen-voters, who vote for the incumbent government or the opponent party (which is also implicit and not modeled explicitly) based on the economic performance of the former, wherein the voters are assumed to care about the level of fiscal deficit in the economy. The citizen-voters are favorable toward the incumbent's economic performance below an acceptable level of budgetary deficit. If instead the budgetary deficit exceeds a certain threshold level, it generates diminishing utility for the incumbent government in terms of loss of voting support, such that voters might even vote the government out. The analysis considers two types of incumbents – opportunist and partisan. The opportunist politician aims to mobilize voting support by manipulating economic policies, while the partisan politician has clearly defined economic policy preferences – reflecting the heterogeneous preferences of different voter-groups. Specifically, by characterizing the opportunistic or partisan behavior through use of different parameters of the model, the paper derives interesting implications for the time path of voting support and budgetary deficit for each type. The paper is also extended to include the possibility of anti-incumbency and understand its implications on voting support for the opportunistic and partisan incumbent. To the best of our knowledge, this contribution is unique in terms of looking at voting behavior vis-a-vis fiscal deficit in a dynamic optimal control setting defined in finite time.

The key results derived are – (i) voters will render positive voting support in case of both opportunist and partisan incumbent, but the presence of anti-incumbency would imply rejecting the same in the opportunist case, (ii) creating budgetary deficit will be costlier in the opportunistic case than the partisan one, that is, the deviation of budgetary deficit from the benchmark will be more pronounced in the case of an opportunistic incumbent than a partisan incumbent, and accordingly, (iii) votes garnered per unit of deficit incurred would be less in the opportunistic case than in the partisan case.

The paper is organized as follows. Section 2 introduces the basic model and derives the optimal path for voting support and budgetary deficit, based on the interaction between incumbent and citizen-voters. Section 3 characterizes the behavior of the opportunist incumbent, while Section 4 analyzes the case of the partisan incumbent. The role of anti-incumbency (with opportunistic behavior) is also characterized in Section 3, whereas anti-incumbency in partisan case does not satisfy the regularity condition (as explained later), and hence, dropped from our analysis. Section 5 concludes.

2. The Model

Consider an economy with an incumbent politician and a continuum of citizen-voters. The incumbent incurs the budgetary expenditure on public goods (for economic development) as well as it strives to get back to power in the next election. That is, the incumbent is not benevolent and her/ his objective function is a weighted sum of utility from voting support and disutility from budgetary deficit. The deficit is run to provide for "populist" or "visible" expenditure. Accordingly, the optimization problem of the incumbent is defined over the finite time interval [0, T] and is mathematically expressed as-

$$Max \int_0^T e^{-\rho t} \frac{[M(t)-\delta\{D(t)-D^*\}]^{1-\epsilon}}{1-\epsilon} dt, \qquad (1)$$

Subject to,

$$\dot{M}(t) = \alpha D(t) - \gamma M(t),\, M(0) = M_0 > 0,\, M(T) free, \qquad (2)$$

$$G(t) = \tau(t) + D^* + \omega(t) \Rightarrow D(t) - D^* = \eta(t) \qquad (3)$$

where ρ in eq. (1) is the discount rate, $M(t)$ is the voting support by the citizen-voters that is treated as the state variable, and $D(t)$ is deficit incurred due to expenditure on public goods in the economy that constitutes the control variable. The parameters ϵ and δ respectively capture the intertemporal elasticity of substitution, and the weight on disutility from budgetary deficit relative to utility from voting support. The equation of motion of $M(t)$ in eq. (2) is positively related to the level of deficit run in the economy, and this positive relationship has been depicted by the parameter α. Moreover, it is negatively related to the existing level of support, $M(t)$, whose strength is captured by the parameter γ, also called the friction parameter.[6] Most logically, we assume that $\alpha > \gamma$. $G(t)$ is the aggregate government expenditure defined as the sum of $\tau(t)$, government tax revenue, and $\omega(t)$, which is the deficit shock to the economy in eq. (3). Note that $\omega(t)$ impacts the economy positively or negatively depending on $D(t) - D(t)^* \gtrless 0$. Furthermore, $[M(t) - M(t)^*]\lambda_M(T) = 0$ is the transversality condition, where $\lambda_M(.)$ is costate variable associated with the state change equation in (2).

Given a politically inclined incumbent, the possibility of budgetary deficit being very large near the election time is not ruled out, as the government attempts to woo the voters by spending large sums of money on visible public goods in the economy rather than being concerned about running high fiscal deficit.

2.1 Optimal Time Path

The Hamiltonian for the optimization program in the previous section can be expressed as:

$$H = \left[\frac{[M(t) - \delta\{D(t) - D^*\}]^{1-\epsilon}}{(1-\epsilon)}\right] e^{-\rho t} + \lambda_M(t)[\alpha D(t) - \gamma M(t)] \qquad (4)$$

Using the method of optimal control, we have,

$$\frac{\partial H}{\partial D(t)} = 0$$

$$\Leftrightarrow \ \delta[M(t) - \delta\{D(t) - D^*\}]^{-\epsilon} e^{-\rho t} = \alpha\lambda_M(t) \qquad (5)$$

and

$$\dot{\lambda_M}(t) = -\frac{\partial H}{\partial M(t)} \quad \Leftrightarrow$$

$$\Leftrightarrow \ \dot{\lambda_M}(t) - \gamma\lambda_M(t) = -[M(t) - \delta\{D(t) - D^*\}]^{1-\epsilon} e^{-\rho t} \qquad (6)$$

and the state variable M(t) must adhere to the time path defined by,

$$\dot{M}(t) = \alpha D(t) - \gamma M(t) \qquad (7)$$

The solution to this program yields the optimal time path of voting support rendered to the incumbent by citizen-voters, that is, $M(t)$ and that of fiscal deficit incurred on account of government expenditure on public goods, captured by $[D(t) - D^*]$.

Proposition 1: *The equilibrium level of voting support offered to the incumbent by the citizen-voters, $M(t)$, and the magnitude of excessive fiscal deficit run by the incumbent, $[D(t) - D^*]$, are found to be:*

[6] Note that, as more and more voting support is rendered to the incumbent, there will be more withdrawal (friction) of the citizen voters, which may also be due the presence of an alternative party in political arena.

$$M(t) = \left[M_0 + \frac{\alpha\delta D^*}{\alpha-\delta\gamma} \right] e^{\frac{(\alpha-\delta\gamma)}{\delta}t} - \frac{\alpha\delta D^*}{\alpha-\delta\gamma} + \frac{(\frac{\alpha}{\delta})^{\frac{\epsilon-1}{\epsilon}}(Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{(\alpha-\delta\gamma)}{\delta\epsilon}T}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{e^{\frac{(\alpha-\delta\gamma-\delta\rho)t}{\epsilon}} - e^{\frac{(\alpha-\delta\gamma)t}{\delta}}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right] \quad (8)$$

$$M(t) = \underbrace{\Gamma_1 e^{\frac{(\alpha-\delta\gamma)}{\delta}t} - \Gamma_2}_{(+)} + \underbrace{\frac{\Gamma_3 e^{\frac{(\alpha-\delta\gamma)}{\delta\epsilon}(t-T)}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{e^{-\frac{\rho}{\epsilon}t} - e^{\frac{(\epsilon-1)}{\delta\epsilon}(\alpha-\delta\gamma)t}}{\Gamma_4} \right]}_{(+)/(-)} \gtrless 0 \quad (9)$$

$$D(t) - D^* = \frac{1}{\delta}M(t) - \delta^{\frac{1-\epsilon}{\epsilon}}(\alpha Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{1}{\epsilon}t + \frac{(\alpha-\delta\gamma}{\delta\epsilon}(t-T)} \quad (10)$$

$$D(t) - D^* = \frac{\Gamma_1}{\delta} e^{\frac{(\alpha-\delta\gamma)}{\delta}t} - \frac{\Gamma_2}{\delta} - \frac{\frac{\Gamma_3}{\alpha} e^{\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}t} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}\right] - \frac{\epsilon-1}{\delta\epsilon}\left[(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}\right] e^{-\frac{\rho}{\epsilon}t}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right] \quad (11)$$

$$D(t) - D^* = \underbrace{\frac{\Gamma_1}{\delta} e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t} - \frac{\Gamma_2}{\delta}}_{(+)} + \underbrace{\frac{\frac{\Gamma_3}{\alpha} e^{\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}t} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}\right] - \frac{\epsilon-1}{\delta\epsilon}\Gamma_4 e^{-\frac{\rho}{\epsilon}t}}{\Gamma_4} \right]}_{(+)/(-)} \gtrless 0 \quad (12)$$

where, $\Gamma_1 = M_0 + \frac{\alpha\delta D^*}{\alpha-\delta\gamma}$, $\Gamma_2 = \frac{\alpha\delta D^*}{\alpha-\delta\gamma}$, $\Gamma_3 = (\frac{\alpha}{\delta})^{\frac{\epsilon-1}{\epsilon}}(Z_M)^{-\frac{1}{\epsilon}}$ and $\Gamma_4 = \frac{\alpha\delta D^*}{\alpha-\delta\gamma}$

The detailed derivations for the expressions in eq. (9) and (12) can be found in Appendix A. In general, in eq. (9) the sum of the first two terms in the r.h.s. is non-negative, in view of $e^{\frac{(\alpha-\delta\gamma)}{\delta}} - 1 \geq 0$, while the third term is ambiguous in sign, since 'ϵ' can be in general be $\gtrless 1$ and $e^{\frac{\rho}{\epsilon}t} - e^{\left(\frac{\epsilon-1}{\delta\epsilon}\right)(\alpha-\delta\gamma)t} \gtrless 0$, according to as $(1-\epsilon) \gtrless \frac{\delta\rho}{(\alpha-\delta\gamma)}$. Following the same reason, in the r.h.s. of eq. (11) as well, the sum of the first two terms is positive, while the third term is ambiguous in sign. Thus, in general; both $M(t)$ and $[D(t) - D^*]$ are ambiguous in sign.

2.2 Regularity Conditions

Since the optimal time paths defined in (9) and (12) are dependent on several parameters, namely, $\rho, \alpha, \gamma, \delta, \epsilon$ and D^*, we need to derive the regularity condition(s) that would ensure that a well-defined solution to the cumulative discounted utility for the incumbent exists. By substituting the solutions for $M(t)$ and $[D(t) - D^*]$ in the welfare function in (1) we get,

$$U = \int_0^T \frac{(\frac{\alpha Z_M}{\delta})^{\frac{\epsilon-1}{\epsilon}}}{1-\epsilon} e^{(1-\epsilon)\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T) - \frac{\rho}{\epsilon}t} dt, \quad (13)$$

A sufficient condition for which to be positive is,

$\epsilon < 1$ such that $\epsilon \geq 1$ is ruled out. (14)

The expression in (12) can be solved to yield,

$$U = \frac{(\frac{\alpha Z_M}{\delta})^{\frac{\epsilon-1}{\epsilon}}}{\frac{(\epsilon-1)^2}{\delta\epsilon}} \left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right] \tag{15}$$

which, if positive, implies that the ratio, $\left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right] > 0.$

This entails the necessary condition that,

either, $e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T} > 0 \;\Rightarrow\; (\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1} > 0 \;\Leftrightarrow (1-\epsilon) > \frac{\rho\delta}{\alpha-\delta\gamma}$, (16)

or, $e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T} < 0 \;\Rightarrow\; (\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1} < 0 \;\Leftrightarrow (1-\epsilon) < \frac{\rho\delta}{\alpha-\delta\gamma}$. (17)

The two necessary conditions (16) and (17) have an intuitive appeal for our analysis. An interesting feature of this research is the role of opportunism and partisan behavior of the incumbent, and the key differences between the two in terms of the implications for budgetary deficit and voting support. Since, an opportunistic incumbent is primarily interested in garnering votes, and manipulates budgetary deficit toward the end, she/ he is assumed to have the willingness to accept large fluctuations in utility from voting support, net of dis-utility from fiscal deficit. Parametrically, this is captured by a low enough value of 'ϵ' and an assignment of a sufficiently low weight on utility loss from fiscal deficit implied by a small enough value of 'δ'. Notably, the regularity condition in (16) satisfies these parametric restrictions. The opposite is true for a partisan incumbent, who has distinct preferences on economic policies, reflecting the specific ideologies of the voters. This implies a low willingness to tolerate fluctuations in utility over time and a high disutility from budgetary deficit, indicated by a high enough value of 'ϵ' and 'δ'. Crucially, the regularity condition in (17) corresponds to this case. As will be seen, both (16) and (17) will play an important role in defining the time path of the incumbent depending on whether she/ he displays an opportunist or a partisan behavior.

3. Opportunist Incumbent

The opportunist incumbent government is assumed to be the one which is more likely to adopt populist policies in the time period closer to the election, and accordingly runs a higher fiscal deficit than D^*. Generally, an opportunist is willing to accept sharp changes in marginal utility from voting support over time, and has a small enough marginal utility loss from excessive fiscal deficit. As discussed, the parametric configuration in this case is characterized by $(1-\epsilon) > \frac{\rho\delta}{\alpha-\delta\gamma}$.

3.1 Opportunism in the absence of anti-incumbency

Given the parametric restriction in (16),

Proposition 2*: In the case of an opportunist incumbent and no anti-incumbency, if $\alpha > \gamma$ such that $\alpha > \delta\gamma$, 'ϵ' and 'δ' are both positive but small enough (or even close to zero),$0 < \rho < 1$, and$(1-\epsilon) > \frac{\rho\delta}{\alpha-\delta\gamma}$, the optimal level of voting support from citizen-voters, $M(t)$, defined in eq. (9) will be strictly positive.*

The proof proceeds as follows. Since, we are analyzing the case of an incumbent politician, $M_0 > 0$ and large. Moreover, in view of $\alpha > \gamma$ and $e^{\frac{(\alpha-\delta\gamma)}{\delta}t} - 1 > 0$, the first term $\Gamma_1 e^{(\frac{\alpha-\delta\gamma}{\delta})t}$ will tend to dominate the second term, Γ_2. Also, in the opportunistic case, the ratio $\left[\frac{e^{-\frac{\rho}{\epsilon}t} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}}{\Gamma_4}\right]$ in the third term of (9) is positive (from (16) both the numerator and denominator of this ratio are positive). However, 'δ' and 'ϵ' being very small makes the values of both $e^{-\frac{\rho}{\epsilon}t}$ and $e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}$ in the third term rather small, implying that their difference will also be small enough. Further, the term in the denominator, that is, $\frac{\epsilon-1}{\delta\epsilon}$ will be large (again from 'δ'and from 'ϵ' being small enough) and negative. Using the same reasoning, Γ_3 will be small enough and $e^{\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}$ although rising will be very small. Thus, the entire third term will be small enough (in fact, in the special case of $\epsilon \to 0$, the entire third term will vanish). Overall, the first two terms will tend to dominate the third term, implying that the optimal voting support $M(t)$ will be positive.

Proposition 3*: Given an opportunist incumbent, absent anti-incumbency, and the parametric restrictions as in Proposition 2, the government deficit that is run, in terms of $[D(t) - D^*]$, characterized by eq. (12) will also be positive.*

The proof proceeds as follows. Again, $M_0 > 0$ and large. Also, with opportunism, $e^{-\frac{\rho}{\epsilon}t} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t} > 0$ implies Γ_4. Further, with the assumption $\epsilon < 1$ and very small in magnitude,$\left[\frac{\alpha}{\delta}\left(e^{-\frac{\rho}{\epsilon}t} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}\right) - \frac{\epsilon-1}{\delta\epsilon}\Gamma_4 e^{-\frac{\rho}{\epsilon}t}\right] > 0$, but very small. Since, the values 'δ' and 'ϵ' are very small (even close to zero), the denominator of the third term in eq. (12), which is $\frac{\epsilon-1}{\delta\epsilon}$ will be very large and negative. Similarly, $e^{\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}$ is increasing albeit very small. Consequently, the third term of eq. (12) will be small enough (in fact, it would also tend to vanish as $\epsilon \to 0$). Thus, the third term would be dominated by the first two terms, where the first term is already larger than the second, implying that optimal deficit, $[D(t) - D^*]$, will be positive.

It will be interesting to observe in the next proposition that in view of small enough values of 'δ' (that capture the incumbent's opportunism) the time path of $[D(t) - D^*]$ will always lay above that of $M(t)$.

This means that the opportunist incumbent will have to spend more in terms of budgetary deficit for garnering each unit of voting support.

In case of an opportunist incumbent, and absence of anti-incumbency, a higher budgetary deficit just prior to the election is likely to entail higher future taxation in the post-election period. In response, will the rational citizen-voters punish the government if an incumbent exceeds the deficit beyond a threshold level? We find that this is not true in this case. That is,

Proposition 4: *In case of an opportunist incumbent with $\alpha > \gamma$ such that $\alpha > \delta\gamma$ and 'ϵ'and 'δ' being positive but very small (even close to zero), and $0 < \rho < 1$,*

(i) the pay-off in terms of voting support from citizen-voters to the incumbent steadily increases right up to the election time period, 'T'. That is, $\frac{dM(t)}{dt} > 0$ and $\frac{d\eta(t)}{dt} > 0$;

(ii) in order to mobilize an additional unit of voting support, the opportunist government will have to run an incrementally higher level of government deficit. Specifically, $\frac{d\eta(t)}{dt} > \frac{dM(t)}{dt}$.

The proof of *Proposition 4(i)* proceeds as follows. We first look at the change in voting support over time, by substituting for $D(t)$ from (12) into (7). From the regularity condition in (16), at any time $t < T$, we have (a) $\epsilon < 1$, and from the parametric restrictions imposed for the opportunist incumbent, we have (b) $\frac{\alpha-\delta\gamma}{\delta\varepsilon}(t-T) - \frac{\rho}{\epsilon}t < 0$, which increases and approaches $-\frac{\rho}{\epsilon}T$ as $t \to T$.[7] Further, in the last term in eq. (17), the value of $(Z_M)^{-\frac{1}{\epsilon}}$ will be very small as 'ϵ' is very small or even close to zero. For the same reason, the value of $(\frac{\alpha}{\delta})^{\frac{\epsilon-1}{\epsilon}}$ will also be very small. Thus, the magnitude of the last term in eq. (18) is negligible, and the change in voting support over time will be determined by the sum of the first two terms, both of which are positive (from $\alpha > \delta\gamma$). That is,

$$\frac{dM(t)}{dt} = \left(\frac{\alpha-\delta\gamma}{\delta}\right)M(t) + \alpha D^* - (\frac{\alpha}{\delta})^{\frac{\epsilon-1}{\epsilon}}(Z_M)^{-\frac{1}{\epsilon}}e^{-\frac{\rho}{\epsilon}t+\frac{\alpha-\delta\gamma}{\delta\epsilon}(t-T)} > 0 \qquad (18)$$

As for the voting support, the change in the path of the fiscal deficit will also be positive as $t \to T$. The change in deficit over time is derived by differentiating $[D(t) - D^*]$ in (A7) with respect to 't' to get the expression in (19). In eq. (19), $\alpha^{\frac{\epsilon-2}{\epsilon}}\delta^{\frac{1-2\epsilon}{\epsilon}}$can be re-expressed as $\alpha^{\left(-\frac{1}{\epsilon}-1\right)}(\frac{\delta}{\alpha})^{\left(\frac{1-2\epsilon}{\epsilon}\right)}$. Note that, for '$\epsilon$' very small (or close enough to zero), both $\alpha^{(-\frac{1}{\epsilon}-1)}$ and $(\frac{\delta}{\alpha})^{(\frac{1-2\epsilon}{\epsilon})}$ will be very small or close to zero. Similarly, the value of $(Z_M)^{-\frac{1}{\epsilon}}$ will be very small in magnitude. Furthermore, as explaining in the result for change in voting support, from (b) the power of the exponential expression in the third term will be negative, and will approach $-\frac{\rho}{\epsilon}T$ as $t \to T$. On account of this, the exponential expression will rise, albeit to a small enough value since 'ϵ' is very small, or close to zero. On the whole, the third term will approach a small enough

[7] From eq. (18), the part of the last term $e^{-\frac{\rho}{\epsilon}t+\frac{\alpha-\delta\gamma}{\delta\epsilon}(t-T)}$ can be written as $e^{-\frac{\rho}{\epsilon}t}.e^{\frac{\alpha-\delta\gamma}{\delta\epsilon}(t-T)}$. That is, as $t \to T$ and small enough 'ϵ' we have $e^{-\frac{\rho}{\epsilon}t} \to 0$ and $\frac{\alpha-\delta\gamma}{\delta\epsilon}(t-T) \to 1$.

value. Hence, even in this case, the first two terms will be dominating, and the deficit will rise over time. That is,

$$\frac{d\eta(t)}{dt} = \left(\frac{\alpha-\delta\gamma}{\delta^2}\right) M(t) + \frac{\alpha D^*}{\delta} - \alpha^{\frac{\epsilon-2}{\epsilon}} \delta^{\frac{1-2\epsilon}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}} \left[\frac{(1+\epsilon)\alpha-\delta(\gamma+\rho)}{\epsilon}\right] e^{-\frac{\rho}{\epsilon}t+\frac{\alpha-\delta\gamma}{\delta\epsilon}(t-T)} > 0 \quad (19)$$

where, $\eta(t) = [D(t) - D^*]$. Hence, both $\frac{dM(t)}{dt} > 0$ and $\frac{d\eta(t)}{dt} > 0$. Moreover, with $\delta < 1$, from (10), we will have $\frac{d\eta(t)}{dM(t)} = \frac{1}{\delta} > 1$. Intuitively,

Proposition 5: *In order to garner an additional unit of voting support, the opportunist government will have to spend incrementally more in the form of budgetary deficit.*

We now analyze the behavior of $M(t)$ and $\eta(t)$ in the initial time period and the terminal (election) time period 'T'.

Proposition 6: *In case of an opportunist incumbent, when $\alpha > \gamma$ such that $\alpha > \delta\gamma$ and both 'ϵ' and 'δ' are positive but very small (even close to zero), and $0 < \rho < 1$,*

(i) the level of voting support at $t \to T$ will be $M(t) = M_0 > 0$ and the initial level of incumbent's budget deficit will be $[D(t) - D^*] > 0$;

(ii) the terminal time period values of voting support and path of deficit are such that $M(t) < M(T)$ and $\eta(t) < \eta(T)$;

The proof of Proposition 6 (i) proceeds as follows. As $t \to 0$, in eq. (9), the last term in the r.h.s. of the solution to $M(t)$ drops out. Furthermore, in the first term, $(\frac{\alpha\delta D^*}{\alpha-\delta\gamma})e^{(\frac{\alpha-\delta\gamma}{\delta})t}$ is equivalent to $(\frac{\alpha\delta D^*}{\alpha-\delta\gamma})$, which balances out with the third term. Thus, the level of voting support at $t = 0$ is found to be:

$$M(t) = M_0 > 0 \quad (20)$$

As for the level of government deficit at $t = 0$, from eq. (12), from the parametric restrictions for the opportunist, in the second term in the r.h.s., $(\alpha\, Z_M)^{-\frac{1}{\epsilon}}$ will be very small for small enough values of 'ϵ'. Similarly, $\delta^{\frac{1-\epsilon}{\epsilon}}$ will be small, as by assumption, 'δ' is small enough in this case. Furthermore, since $\alpha > \delta\gamma$, where 'δ' and 'ϵ' are very small, $e^{-\frac{(\alpha-\delta\gamma)}{\delta\epsilon}T}$ will also be very small, even when 'T' is finite. Consequently, $-(\alpha\, Z_M)^{-\frac{1}{\epsilon}} \delta^{\frac{1-\epsilon}{\epsilon}} e^{-\frac{(\alpha-\delta\gamma)}{\delta\epsilon}T}$ will be very small implying that;

$$D(t) - D^* = \frac{M_0}{\delta} - (\alpha Z_M)^{-\frac{1}{\epsilon}} \delta^{\frac{1-\epsilon}{\epsilon}} e^{-\frac{(\alpha-\delta\gamma)}{\delta\epsilon}T} > 0. \quad (21)$$

We now proceed to the proof for Proposition 6 (ii). Evaluating eqs. (9) and (12) at $t = T$, the levels of voting support and government deficit in the terminal time can be expressed as:

$$M(T) = \left[M_0 + \frac{\alpha\delta D^*}{\alpha-\delta\gamma} \right] e^{\frac{(\alpha-\delta\gamma)}{\delta}T} - \frac{\alpha\delta D^*}{\alpha-\delta\gamma} + \frac{(\frac{\alpha}{\delta})^{\frac{\epsilon-1}{\epsilon}}(Z_M)^{-\frac{1}{\epsilon}}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{(\epsilon-1)}{\epsilon}\frac{(\alpha-\delta\gamma)}{\delta}T}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right] \tag{22}$$

$$M(T) = \Gamma_1 e^{\frac{(\alpha-\delta\gamma)}{\delta}T} - \Gamma_2 + \frac{\Gamma_3}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{(\epsilon-1)}{\epsilon}\frac{(\alpha-\delta\gamma)}{\delta}T}}{\Gamma_4} \right] \tag{23}$$

$$D(T) - D^* \equiv \eta(T) = M(T) - \delta^{\frac{1-\epsilon}{\epsilon}} (\alpha Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}T} \tag{24}$$

$$= \left[\frac{M_0}{\delta} + \frac{\alpha D^*}{\alpha-\delta\gamma} \right] e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)T} - \frac{\alpha D^*}{\alpha-\delta\gamma} + \frac{(\alpha Z_M)^{-\frac{1}{\epsilon}}\delta^{\frac{1-\epsilon}{\epsilon}}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T}\right] - \frac{\epsilon-1}{\delta\epsilon}\left[(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}\right]e^{-\frac{\rho}{\epsilon}T}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right] \tag{25}$$

$$= \frac{\Gamma_1}{\delta} e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)T} - \frac{\Gamma_2}{\delta} + \frac{\frac{\Gamma_3}{\delta}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T}\right] - \frac{\epsilon-1}{\delta\epsilon}\Gamma_4 e^{-\frac{\rho}{\epsilon}T}}{\Gamma_4} \right] \tag{26}$$

In view of the parametric restrictions for the opportunist incumbent's pay-off, the first terms, namely, $\Gamma_1 e^{\frac{(\alpha-\delta\gamma)}{\delta}T}$ and $\frac{\Gamma_1}{\delta} e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)T}$ in eqs. (23) and (26) respectively, are positive. Also, in view of $\alpha - \delta\gamma$ and $e^{\frac{\alpha-\delta\gamma}{\delta}T} - 1 > 0$, the first terms in both eqs. (23) and (26) will tend to dominate the respective second terms, which are Γ_2 and $\frac{\Gamma_2}{\delta}$. We now focus on the third terms in eqs. (23) and (26). From the regularity condition in (16), the ratio in (23), which is $\left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{(\epsilon-1)}{\epsilon}\frac{(\alpha-\delta\gamma)}{\delta}T}}{\Gamma_4} \right] \equiv \left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{(\epsilon-1)}{\epsilon}\frac{(\alpha-\delta\gamma)}{\delta}T}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right]$ is positive.[8] As the value of 'ϵ' and 'δ' are sufficiently small, $\frac{\epsilon-1}{\delta\epsilon}$ in the denominator in both (23) and (26) will be very large. Also, in the numerator in eq. (23), we have $\Gamma_3 = (\frac{\alpha}{\delta})^{\frac{\epsilon-1}{\epsilon}}(Z_M)^{-\frac{1}{\epsilon}}$, where '$\epsilon$' being very small, both $(\frac{\alpha}{\delta})^{(1-\frac{1}{\epsilon})}$ and $(Z_M)^{-\frac{1}{\epsilon}}$ tends to zero. Hence, in the view of the denominator being very large and the numerator very small, the entire third term in both eqs. (23) and (26) will be sufficiently close to zero. Consequently, the sum of the first two terms (which is positive) will tend to dominate the third term implying that $M(T) > 0$ and $\eta(T) > 0$. Furthermore, $\Gamma_1 e^{\frac{(\alpha-\delta\gamma)}{\delta}T} > \Gamma_1 e^{\frac{(\alpha-\delta\gamma)}{\delta}t}$ will imply that $M(T) > M(t)$. A similar argument applies for $\eta(T)$, such that $\eta(T) > \eta(t)$. Thus, this is true $\forall t < T$.

The results in Propositions 2, 3, 4, 5 and 6 are also corroborated by numerical simulations. Importantly, the numerical values assigned to the parameters satisfy the regularity conditions for the opportunistic case, as stated in eq. (16).

[8] The line of argument here follows the ones in Proposition 2 and 3.

3.1.1 Numerical Simulations

The parametric configurations for the opportunistic incumbent are compiled in Table 1

Table 1: Parametric Configurations in Case of Opportunist Incumbent and No Anti-incumbency

Name of the Parameters	Parameters	Change in Parameters Values	Fixed Parameters
Minimum Voting Support	M_0	-	30
Benchmark Deficit	D^*	-	5
Constant Part of Shadow Value	K_M	-	20
Sensitivity of $D(t)$ to $M(t)$	α	0.05, 0.08, 0.12, 0.15, 0.25	$\gamma = 0.03, \delta = 0.3, \epsilon = 0.05, \rho = 0.02$
Friction Parameter	γ	0.001, 0.004, 0.008, 0.01, 0.03	$\alpha = 0.05, \delta = 0.3, \epsilon = 0.05, \rho = 0.02$
Weight to $[D(t) - D^*]$vs. $M(t)$	δ	0.10, 0.15, 0.25, 0.30, 0.45	$\alpha = 0.05, \gamma = 0.03, \epsilon = 0.05, \rho = 0.02$
Marginal Elasticity of Substitution	ϵ	0.01, 0.03, 0.05, 0.08, 0.12	$\alpha = 0.05, \gamma = 0.03, \delta = 0.3, \rho = 0.02$
Discount Factor	ρ	0.02, 0.03, 0.05, 0.08, 0.10	$\alpha = 0.05, \gamma = 0.03, \delta = 0.3, \epsilon = 0.05$

To begin with, some parameters are assigned fixed values in case of all the four simulations. That is, $M_0 = 30$, $D^* = 5$ and $K_M = 20$. As explained earlier, that $M_0 > 0$ and high enough is plausible follows from the fact that we are modeling the case of an incumbent politician. Next, by changing the other parameters, namely, 'α', 'γ', 'δ', 'ϵ' and 'ρ', one at a time, we trace the time path of voting support and deficit in Figures 3(a) to 3(e).

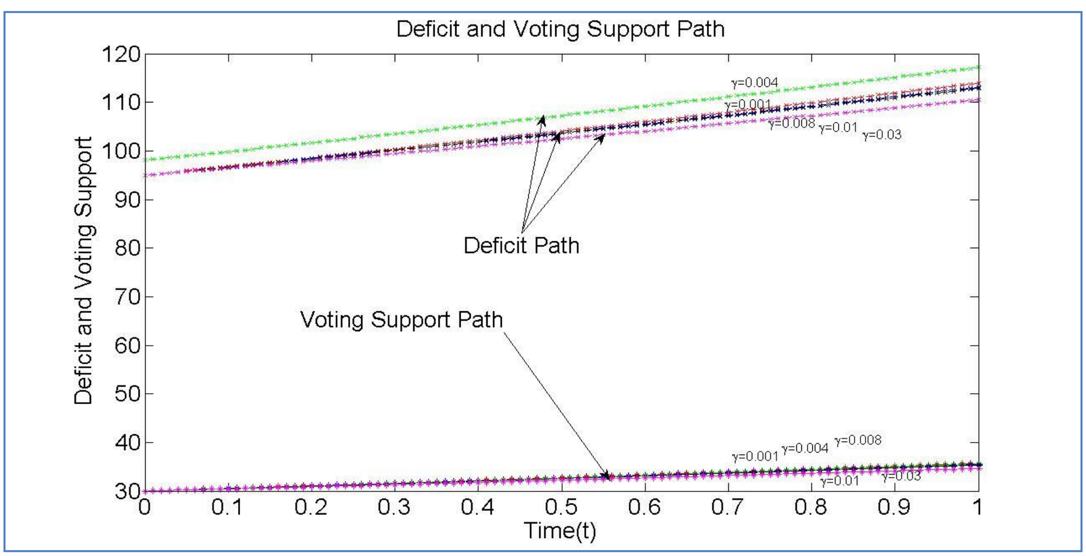
***Proposition 7(s)**: Under different numerical parametric configurations, all of which satisfy the regularity condition in eq.(16), there is a continuous increase in voting support and budgetary deficit.*

In Figure 3(a), even when the value of 'α' is increased from '$\alpha = 0.05$' to '$\alpha = 0.08, 0.12, 0.15$ and 0.20', where 'α' represents the relationship between change in voting support and level of deficit, the positive and rising trend in $M(t)$ and $\eta(t)$ holds. Notably, however, for every additional unit of voting support the incumbent wants to garner, she will have to run an incrementally higher level of fiscal deficit in the economy. In Figure 3(b) the value of 'γ' is changed from '$\gamma = 0.001$' to $\gamma = 0.004, 0.008, 0.01$ and 0.03, while keeping all the other parameters as and'$\alpha = 0.05$, and'$\delta = 0.3$, and'$\epsilon = 0.05$' and '$\rho = 0.02$. The behavior of the voting support path and the deficit in Figure 3(b) shows the same pattern as that in Figure 3(a). Similarly, Figure 3(c) depicts a continuous rise in the level of deficit and voting support when we keep as constant the following parameters and $\alpha = 0.05$, and $\gamma = 0.03$, and $\epsilon = 0.05$ and $\rho = 0.02$ and vary 'δ' from $\delta = 0.10$ to '$\delta = 0.15, 0.25, 0.30, \text{and } 0.45$'. In this case, δ denotes the relative weight on the deviation of actual budgetary deficit from the benchmark level, $D(t) - D^*$, versus the voting support $M(t)$.

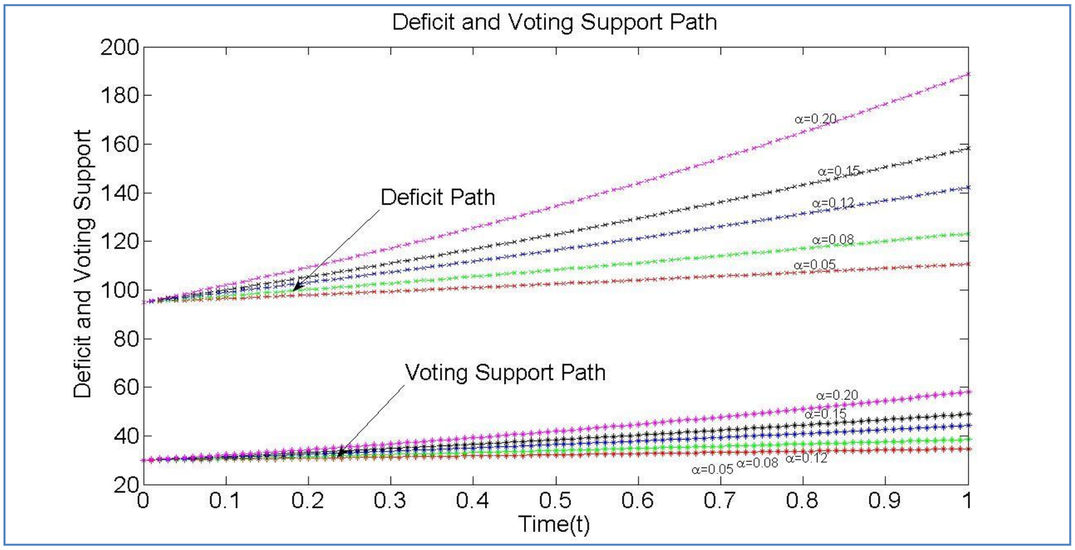
As discussed earlier, 'ϵ' and 'ρ' respectively denote the incumbent's intertemporal elasticity of substitution and the rate of time preference. Figure 3(d) also displays a continuous rise in the level of deficit and voting support, with fixed parameters of '$\alpha = 0.05$', $\gamma = 0.03$, $\delta = 0.3$ and $\rho = 0.03$, while the level of incumbent's intertemporal elasticity of substitution is varied as follows: '$\epsilon = 0.001, 0.004, 0.008, 0.01 \text{ and } 0.03$'. Finally, in Figure 3(e), the rate of time preference parameter, 'ρ', changes as follows: from $\rho = 0.02$ it rises to '$\rho = 0.03, 0.05, 0.08 \text{ and } 0.10$, while we maintain the values of the other parameters as '$\alpha = 0.05$',$\gamma = 0.03$, $\delta = 0.3$ and $\epsilon = 0.05$. The simulations support our earlier result that lower is the weight on the $D(t) - D^*$ as compared to the voting support $M(t)$, higher is the required incremental change in the deficit path for every unit change in the voting support over time.

Figure 3: Time Path of Voting Support and Fiscal Deficit of an Opportunist Incumbent

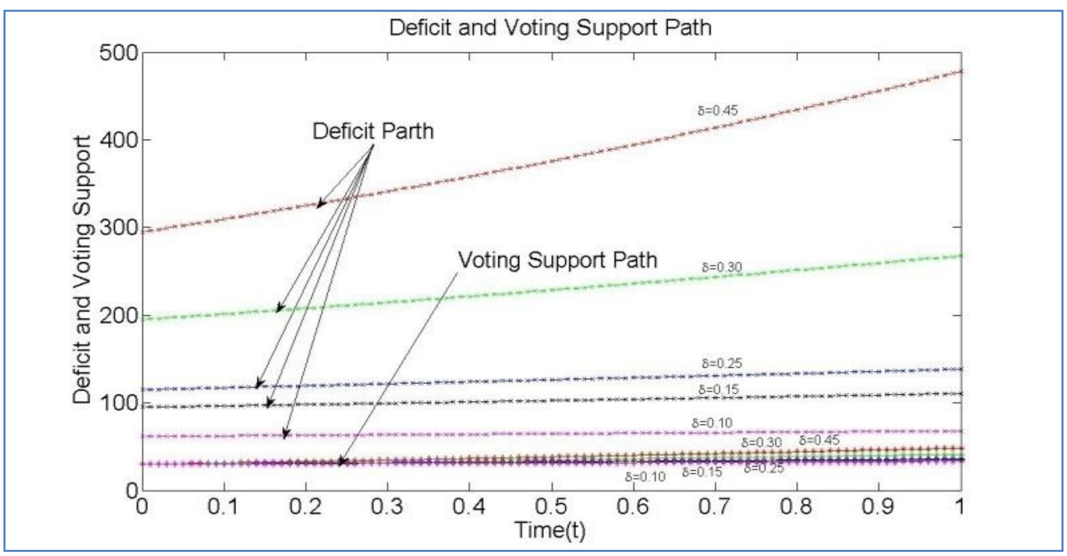
(a) $M(t)$ and $D(t) - D^*$ path when α changes



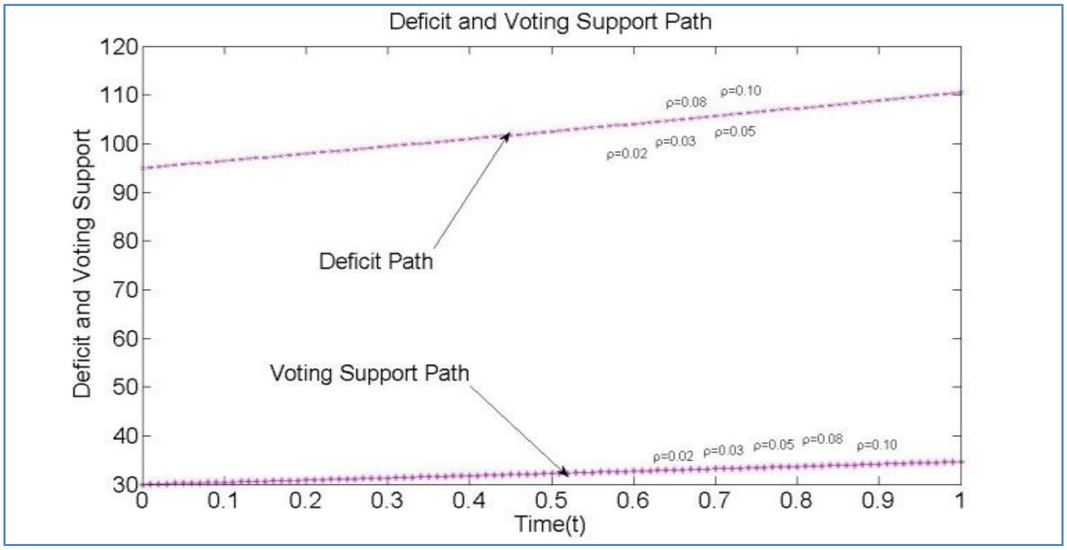
(b) $M(t)$ and $D(t) - D^{*}$ path when γ changes



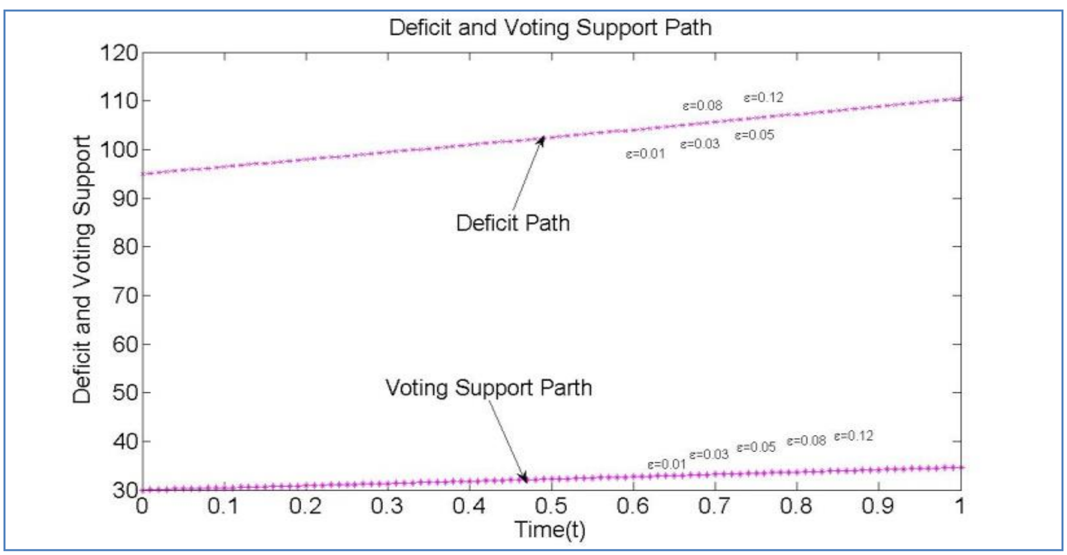
(c) $M(t)$ and $D(t) - D^{*}$ path when δ changes



(d) $M(t)$ and $D(t) - D^{*}$ path when ϵ changes



(e) $M(t)$ and $D(t) - D^*$ path when ρ changes



3.2. Opportunistic Incumbent in the Presence of Anti-Incumbency

In this case, while the incumbent government continues to be an opportunist, the response of the voters is not supportive on account of the presence of anti-incumbency. In general, anti-incumbency could be ascribed to high friction amongst the citizen voters toward the incumbent, either due to the presence of a competent challenger as an alternative or due to a very high cost of rendering support to the incumbent (both of which are not modeled explicitly here). Instead, for our analysis, the presence of anti-incumbency is captured by a high enough value of the friction parameter, 'γ', relative to 'α' Eqs. (9) and (12) now yield that,

Proposition 8: *In case of an opportunist incumbent and the presence of anti-incumbency, captured by $\alpha < \gamma$, such that $\alpha < \delta\gamma$, 'ϵ' and 'δ' continue to be both positive but very small (even close to zero), $0 < \rho < 1$, and $1 - \epsilon > \frac{\delta\rho}{\alpha - \delta\gamma}$, the optimal level of voting support from citizen-voters, $M(t)$, defined in eq. (9) is found to be positive. Moreover, with anti-incumbency, $M(t)$ will be falling over time.*

This can be explained as follows. In view of $\alpha < \gamma$ such that $\alpha < \delta\gamma$, we have the first term, $\Gamma_1 e^{(\frac{\alpha-\delta\gamma}{\delta})t}$, as positive but smaller in magnitude than in case of no anti-incumbency. Moreover, the second term, Γ_2, in the r.h.s. of eq. (9) is negative, implying the difference of the first two terms is positive, especially in view of $M_0 > 0$ and large. Furthermore, on account of opportunism, the numerator and denominator of the ratio in the second term of eq. (9), that is, $\left[\frac{e^{-\frac{\rho}{\epsilon}t} - e^{\frac{(\epsilon-1)}{\delta\epsilon}(\alpha-\delta\gamma)t}}{\Gamma_4}\right]$ will have the same (positive) sign, implying that the ratio will be positive. However, in view of both 'ϵ' and 'δ' small enough, the difference of the two terms in the numerator will be small. Further, in the third term again, Γ_3 is small enough in magnitude and $e^{\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}$ will be larger than in case of no anti-incumbency (from $\alpha < \delta\gamma$ and $t \leq T$ albeit declining overtime and converging to 1 as $t \to T$. As $\epsilon < 1$ and both 'ϵ' and 'δ ' are very small, the entire third term will be very small in magnitude and will be dominated by the sign of the first two terms. Thus, the optimal voting support, $M(t)$ will be positive.

As for the change in voting support over time, from (18) it is easy to infer that the effect of the first term, $\left(\frac{\alpha-\delta\gamma}{\delta}\right)M(t) < 0$ (from $\alpha < \delta\gamma$) will be the dominant one, while the second term remains positive. The third term is small enough in magnitude, on account of 'ϵ' and 'δ ' being small, and is dominated by the sign of the first term. Thus, present anti-incumbency, $\frac{\partial M(t)}{\partial t} < 0$.

Proposition 9: *When the incumbent is an opportunist and there is presence of anti-incumbency, which is captured by $\alpha < \gamma$, such that $\alpha < \delta\gamma$, 'ϵ'* and 'δ ' *continue to be both positive but very small (even close to* *zero), 'ϵ' and '$0 < \rho < 1$', and $1 - \epsilon > \frac{\delta\rho}{\alpha - \delta\gamma}$, the government deficit in terms of $D(t) - D^*$, defined in eq.(12), is also found to be positive but continuously declining over time.*

That optimal $D(t) - D^* > 0$ follows from $M(t) > 0$ and δ being small enough, both of which imply that the first term in (12) will dominate the remaining terms that are small enough in magnitude on account of both 'ϵ' and 'δ' being small enough (or even close to zero). Similar to the change in voting support over time, from (19), the change in budgetary deficit, will also be determined by the sign of the first term, which is a scale up of the first two terms of equation (18), namely, $\frac{1}{\delta}\left[\left(\frac{\alpha - \delta\gamma}{\delta}\right) M(t) + \alpha D^*\right] < 0$ (from $\alpha < \delta\gamma$) and 'δ' small enough, even close to zero. In comparison, the third term is again small enough in magnitude, which follows from both 'ϵ' and 'δ' being small in value.

Thus, we get that, with anti-incumbency, both $\frac{\partial \eta(t)}{\partial t} < 0$. The results in Propositions 8 and 9 can also be substantiated through numerical simulations.

3.2.1 Numerical Simulations

Again, numerical simulations were carried out to find support for the level and change in the voting support, $M(t)$, and budgetary deficit, $D(t) - D^*$, over time. The following numerical parametric configurations capture the underlying notion of an opportunistic incumbent in the presence of anti-incumbency. We retain the values of all the parameters at the same level as in section 3.1.1, with the exception of the parameter γ, which is now assigned a higher value to capture the notion of a higher friction amongst the citizen voters that results in anti-incumbency (see Table 2). Specifically, the parameters now satisfy the restrictions stated in Propositions 7 and 8.

Table 2: Parametric Configurations in Case of Opportunist Incumbent and Present Anti-incumbency

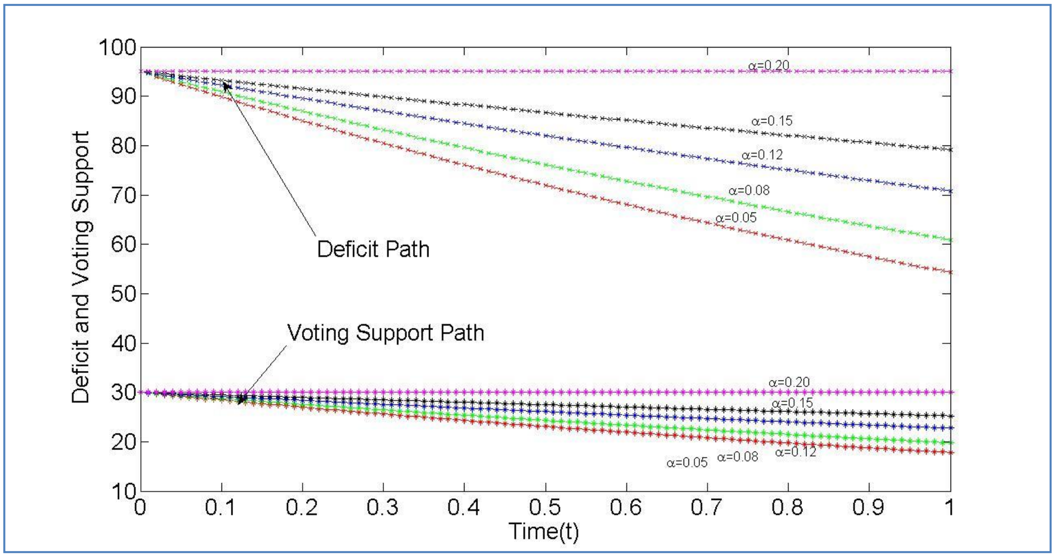
Name of the Parameters	Parameters	Change in Parameters Values	Fixed Parameters
Minimum Voting Support	M_0	-	30
Benchmark Deficit	D^*	-	5
Constant Part of Shadow Value	K_M	-	20
Sensitivity of $D(t)$ to $M(t)$	α	0.05, 0.08, 0.12, 0.15, 0.20	$\gamma = 0.70, \delta = 0.3, \epsilon = 0.05, \rho = 0.02$

Friction Parameter	γ	0.35, 0.40, 0.50, 0.60, 0.70	$\alpha = 0.05, \delta = 0.3, \epsilon = 0.05, \rho = 0.02$
Weight to $[D(t) - D^*]$vs. $M(t)$	δ	0.10, 0.15, 0.25, 0.30, 0.45	$\alpha = 0.05, \gamma = 0.70, \epsilon = 0.05, \rho = 0.02$
Marginal Elasticity of Substitution	ϵ	0.01, 0.03, 0.05, 0.08, 0.12	$\alpha = 0.05, \gamma = 0.70, \delta = 0.3, \rho = 0.02$
Discount Factor	ρ	0.02, 0.03, 0.05, 0.08, 0.10	$\alpha = 0.05, \gamma = 0.70, \delta = 0.3, \epsilon = 0.05$

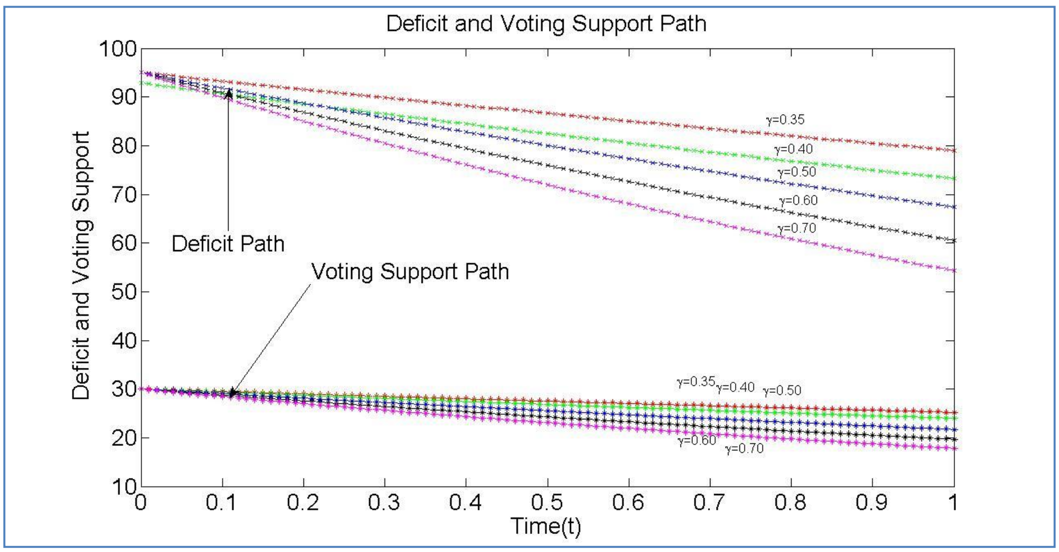
Table (4) reports the parameters for simulations, where the trends in voting support and deficit have been captured by assigning fixed values for some, whereas the other parameters are changing. The fixed parameters are, $M_0 = 30$, $D^* = 5$ and $K_M = 20$. It is found that, for high enough initial level of voting support, M_0, the time path of voting support and budgetary deficit will be positive. That M_0 is large is plausible as we are modeling the case of an incumbent politician. The results of all the five simulation runs, depicted in Figures 4(a) to 4(e), capture the comparative dynamics with respect to change in parameters α, γ, δ, ϵ and ρ. As explained in Propositions 7 and 8, both $M(t)$ and $\eta(t)$ are found to be continuously falling in the presence of the anti-incumbency. Comparing these with those in section 3.1.1, the only parameter now changing is γ.

Figure 4: Time Path of Voting Support and Fiscal Deficit of an Opportunist Incumbent in the Presence of Anti-incumbency

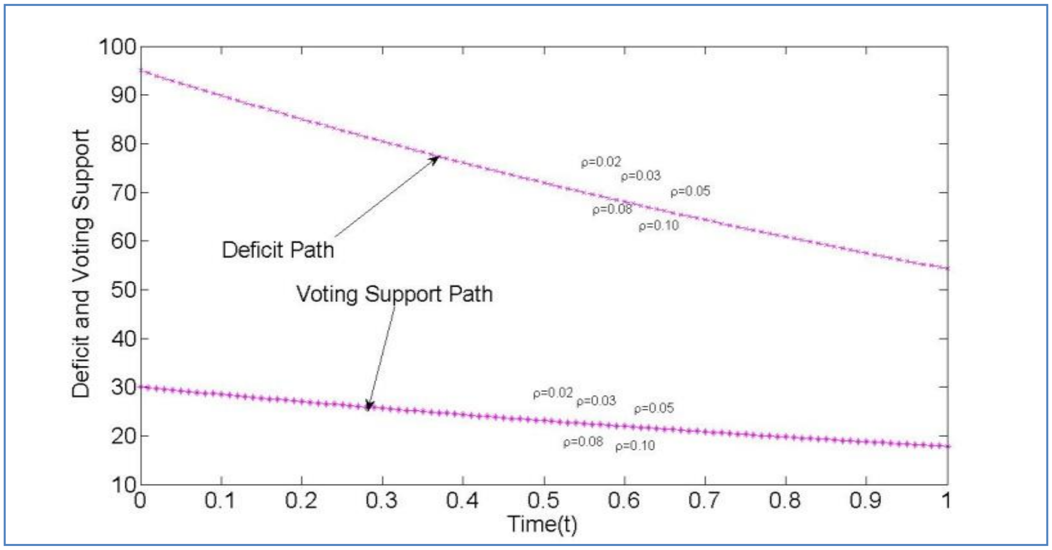
(a) $M(t)$ and $D(t) - D^*$ path when α changes



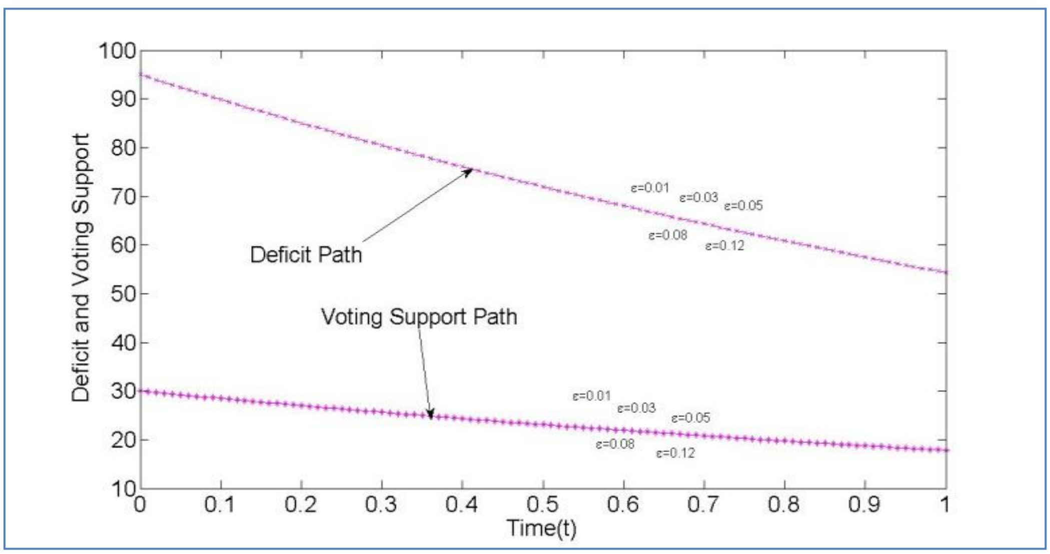
(b) $M(t)$ and $D(t) - D^*$ path when γ changes



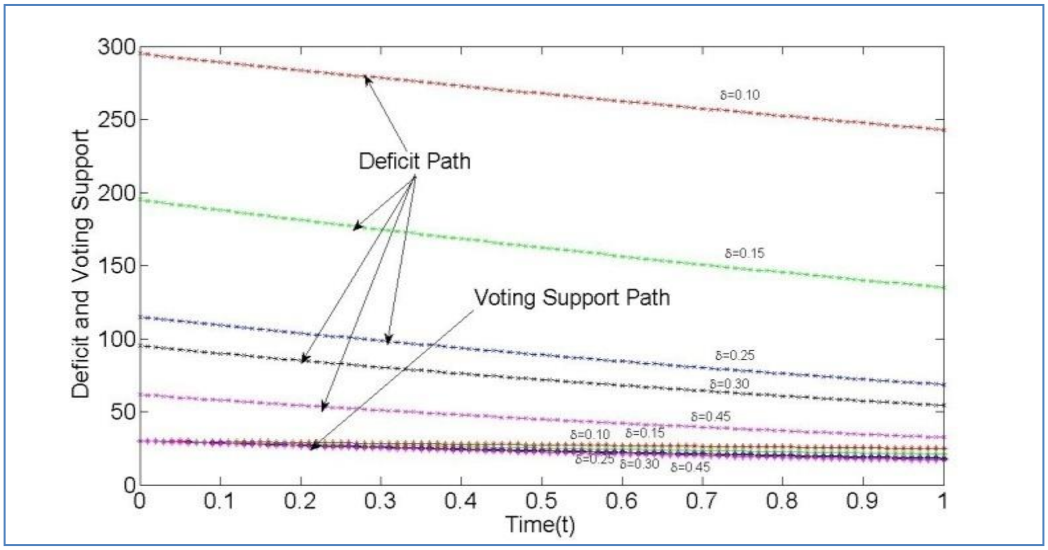
(c) $M(t)$ and $D(t) - D^*$ path when δ changes



(d) $M(t)$ and $D(t) - D^*$ path when ϵ changes



(e) $M(t)$ and $D(t) - D^*$ path when ρ changes



Proposition 10(s): *Under different numerical parametric configurations that satisfy the regularity condition in eq.(16) and considering the case where $\alpha > \delta\gamma$, there is a continuous decline in voting support and budgetary deficit*.

In Figure 4(a), we attempt comparative dynamics with respect to change in α, from $\alpha = 0.05$ to $\alpha = 0.08, 0.12, 0.15$ and 0.20, while the values of the other parameters are assumed to be fixed at $\gamma = 0.70$, $\delta = 0.30$, $\epsilon = 0.05$ and $\rho = 0.02$.In Figure 4(b), the value of γ is changing according to $\gamma = 0.35, 0.40, 0.50, 0.60, 0.70$ with fixed values of $\alpha = 0.05$, $\delta = 0.30$, $\epsilon = 0.05$ and $\rho = 0.02$. Figure 4(a) and 4(b) trace a continuous decline in voting support and deficit over time. Additionally, Figure 4(c) and 4(d) capture the time path of voting support and deficit path with the respective changes in the parameters δ, from $\delta = 0.10, 0.15, 0.25, 0.30$ and 0.45, and ϵ according to $\epsilon = 0.01, 0{,}03, 0.05, 0.08$ and 0.12. With respect to the changes in 'δ' and 'ϵ', the corresponding fixed values of other parameters are $\alpha = 0.05$, $\gamma = 0.70$, $\epsilon = 0.05$ and $\rho = 0.02$ in case of the former, and $\alpha = 0.05$, $\gamma = 0.70$, $\delta = 0.70$ and $\rho = 0.02$ in the latter case. Figure 4(e) captures the time path of voting support and deficit when the time preference parameter ρ is changing from $\rho = 0.02, 0.03, 0.05, 0.08$ and 0.10, while keeping the remaining parameters fixed as follows: $\alpha = 0.05$, $\gamma = 0.70$, $\delta = 0.70$ and $\epsilon = 0.05$. Notably, Figure 4(c) also depicts a falling trend in $M(t)$ and $\eta(t)$ over time. Further, although Figures 4(d) and 4(e) show a similar pattern of fall in voting support path and deficit path as the last three cases, in case of both, the path is not found to be sensitive to change in the respective parametric configurations. Moreover, in all the five cases in general, the fall in deficit is faster as the value of in comparison to the fall in the time of the fiscal deficit.

In the case of opportunism with no anti-incumbency, with $\alpha > \gamma$ such that $\alpha > \delta\gamma$, we found that the time path of $D(t) - D^*$ always lay above the corresponding path of $M(t)$. Interestingly, this holds true even in the presence of anti-incumbency, where γ is high enough and $\alpha < \gamma$ such that $\alpha < \delta\gamma$. However, with anti-incumbency, the paths of both the deficit and the voting support are falling continuously, with the fall in the former sharper than the latter.

4. Partisan Government

Hibbs (1977) introduced the partisan behavior of an incumbent and Alesina (1987, 1988) incorporated rational expectations in the monetary approach of the political business cycle. Contrary to the opportunistic behavior, partisan incumbents have clear economic policy preferences or ideologies, such as - left-wing parties may prefer higher employment and output growth even at the cost of tolerating higher inflation, while the right-wing parties might target lower inflation. We now model the possibility of partisan behavior of the incumbent, assuming perfect information. By this, we imply that the voters know the ideological bent of the incumbent and the actions that she/ he might take. In this case, to contain the extent of opportunistic behavior, the relative weight δ assigned to the deficit, $D(t) - D^*$, is assumed to be close to 1 (in the specific case that we consider, $\delta = 1$), as the partisan incumbent assigns almost equal weight to both voting support, $M(t)$, and budgetary deficit, $D(t) - D^*$. In addition, the partisan behavior may also be captured by a lower intertemporal elasticity of substitution (as the behavior of a partisan incumbent is more predictable and, thus, less variable over time) implied by a higher value of ϵ (which may be close to 1). To begin with, we discuss some analytical results for the partisan case.

4.1 Partisan Incumbent in the Absence of Anti-incumbency

The analysis in this part is analogous to the case of the opportunist incumbent in the absence of an anti-incumbency factor. Here, the only parameters permanently changed are 'δ' and 'ϵ'. We consider higher values of 'ϵ', even close to 1. We retain the assumption of $1 - \epsilon > 0$ for aggregate utility to be positive.

Proposition 11: *When $\alpha > \gamma$ such that $\alpha > \delta\gamma, 0 < \rho < 1,$ $\delta = 1$ and 'ϵ' close to 1, the voting support, $M(t)$, and the level of budgetary deficit of the incumbent, $D(t) - D^*$, are both positive and continuously increasing over time.*

From an observation of the solutions in eqs. (9) and (12), and given the parametric restrictions for partisan behavior, the time paths of both $M(t)$ and $D(t) - D^*$ are positive and increasing up to the election period. For $M(t)$, this can be explained as follows. In view of $M_0 > 0$ and large, and $\alpha > \gamma$, $(e^{(\frac{\alpha-\delta\gamma}{\delta})t} - 1) > 0$. Thus, the first term in eq. (9), that is, $\Gamma_1 e^{(\frac{\alpha-\delta\gamma}{\delta})t}$, will dominate the second term, Γ_2. In the partisan case, the numerator and denominator of the ratio in square brackets in the third term of Eq. (9), that is, $\left[\frac{e^{-\frac{\rho}{\epsilon}t}-e^{\frac{(\epsilon-1)}{\delta\epsilon}(\alpha-\delta\gamma)t}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}}\right]$, will have the same sign (each negative in this case) and the ratio will always be positive. However, despite $\delta = 1$ and 'ϵ' sufficiently large (even close to 1), the values of $e^{-\frac{\rho}{\epsilon}t}$ and $e^{\frac{(\epsilon-1)}{\delta\epsilon}(\alpha-\delta\gamma)t}$ will tend to be very small as the power of the exponential function is always negative, and the difference between the two exponential functions will also be rather small. Further, the value of $\frac{(\epsilon-1)}{\delta\epsilon}$ will be smaller than in the case of opportunism. However, using the same reasoning as in case of opportunism, Γ_3 and $e^{\frac{(\epsilon-1)}{\delta\epsilon}(t-T)}$ will be very small, and although the latter term will be rising over time, it will only approach the value of '1' from below as $t \to T$. Thus, the entire third term will be dominated by the sum of the first two terms, and $M(t)$ will be positive in each time period. Moreover, following the reasoning for the opportunistic case and absent anti-incumbency, $M(t)$ will be rising over time.

We look at the third term of budgetary deficit in eq. (12). From our earlier discussion, in the case of a partisan incumbent, we have $e^{-\frac{\rho}{\epsilon}t} - e^{\frac{(\epsilon-1)}{\delta\epsilon}(\alpha-\delta\gamma)t} < 0$ that implies Γ_4. Further, with $\epsilon < 1$ (and close enough to 1), and $\delta = 1$, $\left[\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}t} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}\right] - \frac{\epsilon-1}{\delta\epsilon}\Gamma_4 e^{-\frac{\rho}{\epsilon}t}\right] < 0$ and hence the ratio $\left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}t}-e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}\right]-\frac{\epsilon-1}{\delta\epsilon}\Gamma_4 e^{-\frac{\rho}{\epsilon}t}}{\Gamma_4}\right] > 0$. Also, since the values of both 'δ' and 'ϵ' are higher in case of the partisan incumbent than in the opportunist case, the denominator of the third term, $\frac{\epsilon-1}{\delta\epsilon}$ in eq. (12) will be small and negative. However, $e^{\frac{(\alpha-\delta\gamma)}{\delta\epsilon}(t-T)}$ will be small albeit increasing only to approach the value 1 from below as $t \to T$. Consequently, the third term of eq.(12) is small and will be dominated by the first term. In fact, the first term will dominate both the second and the third terms. Thus, the $D(t) - D^*$ will be positive. Moreover, similar to the opportunistic case, this will also be rising over time.

The results of numerical simulations in Figure 5(a) and 5(b) support this claim. One can observe a continuous increase in voting support associated with an increase in the budgetary deficit over time in Proposition 12(s),

Proposition 12(s): *For a wide range of parametric configurations, all of which satisfy the restrictions stated in Proposition 11, voting support, $M(t)$, and budgetary deficit, $D(t) - D^*$, of an incumbent will be continuously increasing over time.*

Table 3 contains the parameter values that have been used to simulate the time path of voting support and deficit paths, where fixed values have been assigned to some parameters, whereas other are changed to capture the comparative dynamics. The fixed parameters are the same as in the opportunistic case, namely, $M_0 = 30$, $D^* = 5$ and $K_M = 20$. It is found that, for a high enough initial level of voting support, M_0, the time path of voting support and budgetary deficit will be positive and increasing over time. The five simulations capture the change with respect to change in the following parameters: 'α', 'γ', 'δ', 'ϵ', and 'ρ', respectively. Figure 5(a) captures this when 'α' changes from $\alpha = 0.05\ to\ \alpha = 0.08, 0.12, 0.15$ and 0.20, while the values of the other parameters are assumed to be fixed at $\gamma = 0.03$, $\delta = 1$, $\epsilon = 0.90$, and $\rho = 0.02$. In Figure 5(b), the value of γ is changing according to $\gamma = 0.001, 0.004, 0.008, 0.01, 0.03$, with fixed values of $\alpha = 0.05$, $\delta = 1$, $\epsilon = 0.90$, and $\rho = 0.02$. Similarly, Figures 5(c) and 5(d) capture the time path of voting support and deficit path with the respective change in the parameters δ from $\delta = 0.80, 0.85, 0.90, 0.95$ and $\delta = 1$ and 'ϵ' as $\epsilon = 0.85, 0.88, 0.92, 0.96$ and $\epsilon = 0.99$. Corresponding to the change in 'δ' and 'ϵ', the fixed parametric values are $\alpha = 0.05$, $\gamma = 0.03$, $\epsilon = 0.90$, and $\rho = 0.02$ in the former and $\alpha = 0.05$, $\gamma = 0.03$, $\delta = 1$, and $\rho = 0.02$ in the latter case. Figure 5(e) captures the time path of voting support and deficit when the time preference parameter ρ is changing from $\rho = 0.02, 0.03, 0.05, 0.08$ and $\rho = 0.10$, while keeping the remaining parameters fixed as $\alpha = 0.05$, $\gamma = 0.03$, $\delta = 1$, and $\epsilon = 0.90$. Table 3 summarizes these.

Table 3: Parametric Configurations in Case of Partisan Incumbent and No Anti-incumbency

Name of the Parameters	Parameters	Change in Parameters Values	Fixed Parameters
Minimum Voting Support	M_0	-	30
Benchmark Deficit	D^*	-	5
Constant Part of Shadow Value	K_M	-	20
Sensitivity of $D(t)$ to $M(t)$	α	0.05, 0.08, 0.12, 0.15, 0.25	$\gamma = 0.03, \delta = 1, \epsilon = 0.90, \rho = 0.02$
Friction Parameter	γ	0.001, 0.004, 0.008, 0.01, 0.03	$\alpha = 0.05, \delta = 1, \epsilon = 0.90, \rho = 0.02$
Weight to $[D(t) - D^*]$vs. $M(t)$	δ	0.80, 0.85, 0.90, 0.95, 1.00	$\alpha = 0.05, \gamma = 0.03, \epsilon = 0.90, \rho = 0.02$
Marginal Elasticity of Substitution	ϵ	0.85, 0.88, 0.92, 0.96, 0.99	$\alpha = 0.05, \gamma = 0.03, \delta = 1.00, \rho = 0.02$
Discount Factor	ρ	0.02, 0.03, 0.05, 0.08, 0.12	$\alpha = 0.05, \gamma = 0.03, \delta = 1.00, \epsilon = 0.90$

In case of all the five simulations, the positive and rising trend in $M(t)$ and $\eta(t)$ hold. However, unlike the opportunistic case, now the path of the budgetary deficit, $\eta(t)$, lies below the path of voting support, $M(t)$. This follows from the assumed value of 'δ' being different in this case, and is explained as follows.

Proposition 13: *To garner an additional unit of voting support $M(t)$, the change in the deviation of budgetary deficit from the benchmark will be equal to δ.*

From eq. (A13) in the appendix A, we have the equation

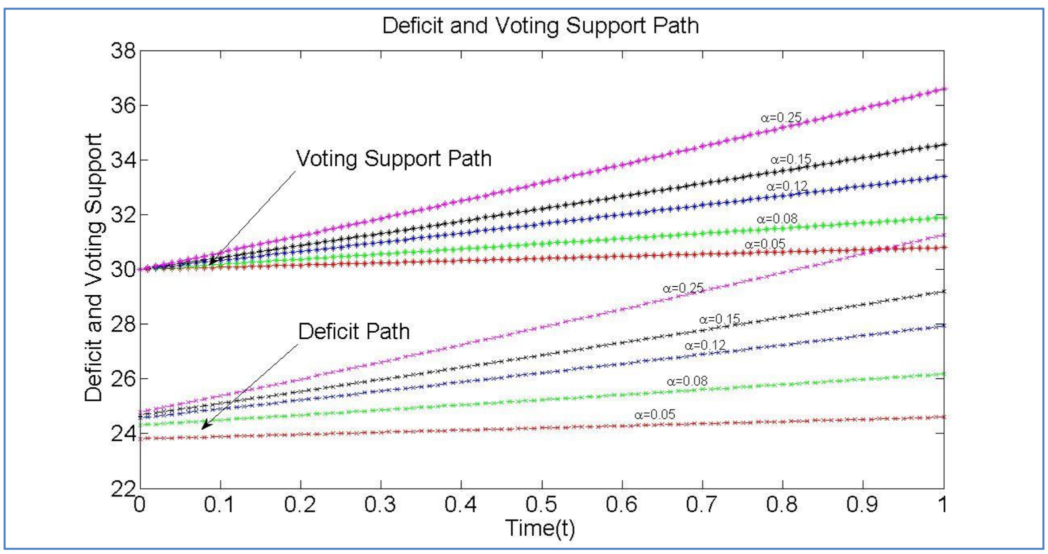
$$D(t) - D^* = \frac{1}{\delta}M(t) - \delta^{\frac{1-\epsilon}{\epsilon}}(\alpha Z_M)^{-\frac{1}{\epsilon}}e^{-\frac{1}{\epsilon}t+\frac{(\alpha-\delta\gamma)}{\delta\epsilon}(t-T)} \quad (27)$$

The above equation can be re-expressed as $M(t) = \delta[D(t) - D^*] + \delta^{\frac{1}{\epsilon}}(\alpha Z_M)^{-\frac{1}{\epsilon}}e^{-\frac{1}{\epsilon}t+\frac{(\alpha-\delta\gamma)}{\delta\epsilon}(t-T)}$

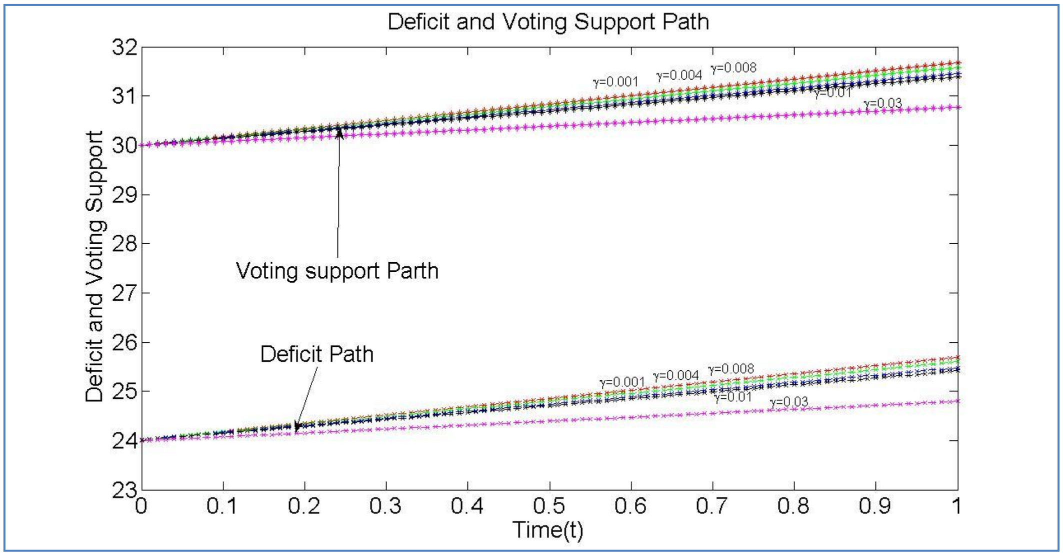
Since, in the opportunistic case, the value of 'δ' is small (even close to zero), it implies that additional voting support garnered due to an incremental increase in the deviation of budgetary spending from the benchmark (D^*) is very small (or even close to zero). Contrary to this, 'δ' is large (even close to 1) in case of a partisan incumbent, and hence the incumbent is able to derive a much larger voting support (even 1:1) with an additional unit increase of current deficit above the benchmark level, D^*.

Figure 5: Time Path of Voting Support and Fiscal Deficit of a Partisan Incumbent

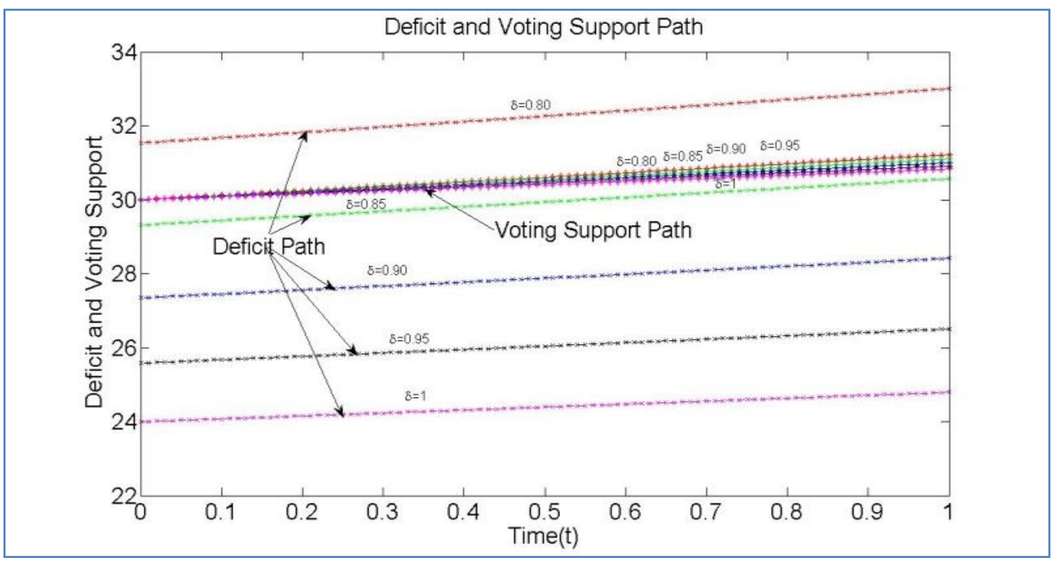
(a) $M(t)$ and $D(t) - D^*$ path when α changes



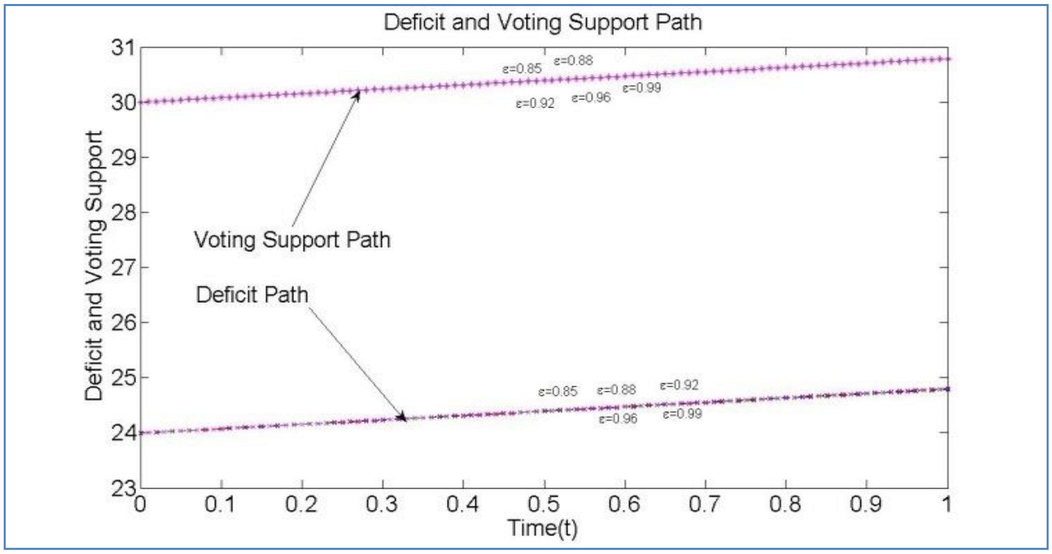
(b) $M(t)$ and $D(t) - D^*$ path when γ changes



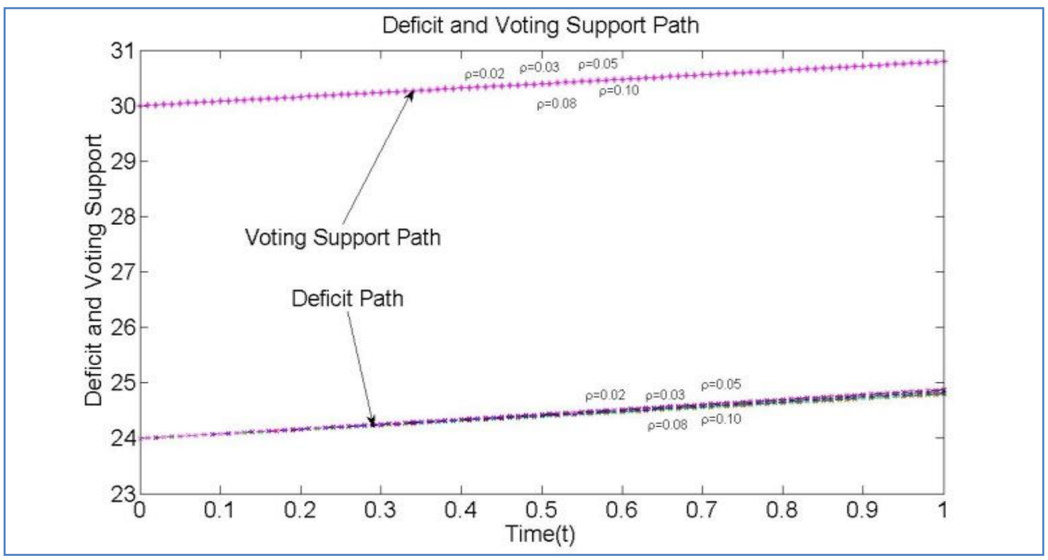
(c) $M(t)$ and $D(t) - D^*$ path when δ changes



(d) $M(t)$ and $D(t) - D^*$ path when ϵ changes



(e) $M(t)$ and $D(t) - D^*$ path when ρ changes



Thus, notably, the incumbent will have to manipulate the deficit much more to get an unit of additional voting support in the opportunistic case than in case of a partisan incumbent. Hence, the opportunist incumbent may end up running a huge deficit close enough to the election.

Finally, given our modeling structure, and the definition of anti-incumbency, the case of anti-incumbency is not found consistent with the regularity condition for a partisan incumbent. Recall that, the regularity condition for the partisan incumbent is $1 - \epsilon < \frac{\rho\delta}{\alpha - \delta\gamma}$ (see eq. (17). To characterize a partisan incumbent with anti-incumbency, we need to have $\alpha < \gamma$ such that $\alpha < \delta\gamma$, $\epsilon < 1$ (close to 1). This violates the regularity condition, $1 - \epsilon < \frac{\rho\delta}{\alpha - \delta\gamma}$, since $1 - \epsilon > 0$ and $\frac{\rho\delta}{\alpha - \delta\gamma} < 0$.

5. Conclusion

In an optimal control method, under the assumption of an iso-elastic kind of the net utility function from voting support vis-a-vis budgetary deficit, the citizen voters provide support to an opportunist as well as a partisan incumbent, but reject the same when there is very strong anti-incumbency factor in the opportunistic case. Given a large enough initial level of voting support (that is plausible for an incumbent politician in office), the path of both voting support and deficit is found to be positive and rising in the case of absence of anti-incumbency. Moreover, to garner additional voting support, the opportunist incumbent has to incur an incrementally higher level of deficit as compared to the partisan incumbent. Thus, an opportunist incumbent is able to mobilize votes at the much higher cost of budgetary deficit to the economy, whereas voting support is positive and increasing even in partisan case but will entail lower cost in terms of budgetary deficit. However, the time path of both voting support and deficit will be falling when anti-incumbency exists.

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Appendix A

Proof of Proposition 1: The Hamiltonian function is

$$H = \left[\frac{[M(t)-\delta\{D(t)-D^*\}]^{1-\epsilon}}{1-\epsilon}\right] e^{-\rho t} + \lambda_M(t)[\alpha D(t) - \gamma M(t)] \quad \text{(A1)}$$

$$\frac{\partial H}{\partial D(t)} = [M(t) - \delta\{D(t) - D^*\}]^{-\epsilon} e^{-\rho t}(-\delta) + \alpha\lambda_M(t) = 0$$

$$\Leftrightarrow \delta[M(t) - \delta\{D(t) - D^*\}]^{-\epsilon} e^{-\rho t} = \alpha \lambda_M(t) \tag{A2}$$

$$\dot{\lambda_M}(t) = -\frac{\partial H}{\partial M(t)} \Leftrightarrow \dot{\lambda_M}(t) = -[M(t) - \delta\{D(t) - D^*\}]^{1-\epsilon} e^{-\rho t} + \gamma \lambda_M(t)$$

$$\Leftrightarrow \dot{\lambda_M}(t) - \gamma \lambda_M(t) = -[M(t) - \delta\{D(t) - D^*\}]^{1-\epsilon} e^{-\rho t} \tag{A3}$$

and,

$$\dot{M}(t) = \alpha D(t) - \gamma M(t) \tag{A4}$$

Substituting eq.(A2) in eq.(A3)

$$\dot{\lambda_M}(t) + \left(\frac{\alpha}{\delta} - \gamma\right) \lambda_M(t) = 0 \Leftrightarrow \lambda_M(t) = K_M e^{-\left(\frac{\alpha}{\delta} - \gamma\right)t} \tag{A5}$$

At $t = T$ and assuming $\lambda_M(T) = Z_M > 0$

$$\lambda_M(T) = K_M e^{-\left(\frac{\alpha}{\delta} - \gamma\right)t} \Leftrightarrow K_M = Z_M e^{-\left(\frac{\alpha}{\delta} - \gamma\right)(t-T)}$$

$$\Leftrightarrow \lambda_M(t) = Z_M e^{-\left(\frac{\alpha}{\delta} - \gamma\right)(t-T)} \tag{A6}$$

The transversality condition is $\lambda_M(T) \geq 0 \Rightarrow [M(T) - M_{Min}]\lambda_M(T) = 0$, since $\lambda_M(T) = Z_M > 0 \Rightarrow M(T) = M_{Min}$. Substituting eq. (A6) in eq. (A2) gives,

$$[M(t) - \delta\{D(t) - D^*\}]^{-\epsilon} e^{-\rho t} = \frac{\alpha}{\delta}\left[Z_M e^{-\left(\frac{\alpha}{\delta} - \gamma\right)(t-T)}\right]$$

$$\Rightarrow \delta[D(t) - D^*] = M(t) - \left(\frac{\alpha Z_M}{\delta}\right)^{-\frac{1}{\epsilon}} e^{-\left(\frac{\alpha}{\delta} - \gamma\right)(t-T)} \tag{A7}$$

$$\Rightarrow D(t) = \frac{1}{\delta} M(t) + D^* - \delta^{\frac{1-\epsilon}{\epsilon}} (\alpha Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}t + \left(\frac{\alpha - \delta\gamma}{\delta\epsilon}\right)(t-T)} \tag{A8}$$

$$\Rightarrow M(t) = \delta[D(t) - D^*] + \left(\frac{\alpha Z_M}{\delta}\right)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}t + \left(\frac{\alpha - \delta\gamma}{\delta\epsilon}\right)(t-T)} \tag{A9}$$

Substituting eq.(A10) in eq.(A4)

$$\dot{M}(t) - \left(\frac{\alpha - \delta\gamma}{\delta}\right) M(t) = -\left(\frac{\alpha}{\delta}\right)^{\frac{\epsilon-1}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}t + \left(\frac{\alpha - \delta\gamma}{\delta\epsilon}\right)(t-T)} + \alpha D^* \tag{A10}$$

Solving the differential equation (A10) gives,

$$M(t) = \frac{\left(\frac{\alpha}{\delta}\right)^{\frac{\epsilon-1}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}t + \left(\frac{\alpha - \delta\gamma}{\delta\epsilon}\right)(t-T)}}{\frac{\epsilon-1}{\epsilon}\left[(\alpha - \delta\gamma) + \frac{\delta\rho}{\epsilon-1}\right]} - \frac{\alpha\delta D^*}{\alpha - \delta\gamma} + C_M e^{\left(\frac{\alpha - \delta\gamma}{\delta}\right)t} \tag{A11}$$

We find solution for $M(t)$ and the values of the constant of integration (C_M) at $t = 0$ gives,

$$M(t) = \left[M_0 + \frac{\alpha\delta D^*}{\alpha - \delta\gamma}\right] e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t} - \frac{\alpha\delta D^*}{\alpha - \delta\gamma} + \frac{\left(\frac{\alpha}{\delta}\right)^{\frac{\epsilon-1}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}} e^{-\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)T}}{\frac{\epsilon-1}{\epsilon}\left[(\alpha-\gamma) + \frac{\delta\rho}{\epsilon-1}\right]} \left[e^{\left(\frac{\alpha-\delta\gamma-\delta\rho}{\delta\epsilon}\right)t} - e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t}\right]$$

$$M(t) = \left[M_0 + \frac{\alpha\delta D^*}{\alpha-\delta\gamma}\right] e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t} - \frac{\alpha\delta D^*}{\alpha-\delta\gamma} + \frac{\left(\frac{\alpha}{\delta}\right)^{\frac{\epsilon-1}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}} e^{-\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}}{\frac{\epsilon-1}{\epsilon}} \left[\frac{e^{\left(\frac{\alpha-\delta\gamma-\delta\rho}{\delta\epsilon}\right)t} - e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t}}{\left[(\alpha-\gamma)+\frac{\delta\rho}{\epsilon-1}\right]}\right] \quad \text{(A12)}$$

where, $\left[C_M = M_0 - \frac{\left(\frac{\alpha}{\delta}\right)^{\frac{\epsilon-1}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}} e^{-\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)T}}{\frac{\epsilon-1}{\epsilon}\left[(\alpha-\gamma)+\frac{\delta\rho}{\epsilon-1}\right]} + \frac{\alpha\delta D^*}{\alpha-\delta\gamma}\right]$

Substituting eq. (A12) in eq. (A7),

$$D(t) - D^* = \frac{1}{\delta} M(t) - \delta^{\frac{1-\epsilon}{\epsilon}} (\alpha Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}t + \left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)} \quad \text{(A13)}$$

$$D(t) - D^* =$$

$$\left[M_0 + \frac{\alpha\delta D^*}{\alpha-\delta\gamma}\right] e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t} - \frac{\alpha\delta D^*}{\alpha-\delta\gamma} + \frac{\left(\frac{\alpha}{\delta}\right)^{\frac{\epsilon-1}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}} e^{-\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)T}}{\frac{\epsilon-1}{\epsilon}\left[(\alpha-\gamma)+\frac{\delta\rho}{\epsilon-1}\right]} \left[e^{\left(\frac{\alpha-\delta\gamma-\delta\rho}{\delta\epsilon}\right)t} - e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t}\right] - \delta^{\frac{1-\epsilon}{\epsilon}} (\alpha Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}t + \left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}$$

(A14)

$$D(t) - D^* = \left[\frac{M_0}{\delta} + \frac{\alpha D^*}{\alpha-\delta\gamma}\right] e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)t} - \frac{\alpha D^*}{\alpha-\delta\gamma} - \frac{(\alpha Z_M)^{-\frac{1}{\epsilon}} \delta^{-\frac{1-\epsilon}{\epsilon}} e^{\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)(t-T)}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}t} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)t}\right] - \frac{\epsilon-1}{\delta\epsilon}\left[(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}\right] e^{-\frac{\rho}{\epsilon}t}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}}\right]$$

(A15)

Proof of Proposition 4:

(i) the path of the voting support and deficit at $t = 0$ is as follows,

$$M(t) = M_0 \quad \text{(A16)}$$

$$D(t) - D^* = M_0 - \delta^{\frac{1-\epsilon}{\epsilon}} (\alpha Z_M)^{-\frac{1}{\epsilon}} e^{-\left(\frac{\alpha-\delta\gamma}{\delta\epsilon}\right)T} \quad \text{(A17)}$$

(ii) the path of voting support and deficit at $t = T$ is as follows,

$$M(T) = \left[M_0 + \frac{\alpha\delta D^*}{\alpha-\delta\gamma}\right] e^{\frac{(\alpha-\delta\gamma)}{\delta}T} - \frac{\alpha\delta D^*}{\alpha-\delta\gamma} + \frac{\left(\frac{\alpha}{\delta}\right)^{\frac{\epsilon-1}{\epsilon}} (Z_M)^{-\frac{1}{\epsilon}}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{(\epsilon-1)}{\epsilon}\frac{(\alpha-\delta\gamma)}{\delta}T}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}}\right] \quad \text{(A18)}$$

$$M(T) = \Gamma_1 e^{\frac{(\alpha-\delta\gamma)}{\delta}T} - \Gamma_2 + \frac{\Gamma_3}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{e^{-\frac{\rho}{\epsilon}T} - e^{\frac{(\epsilon-1)}{\epsilon}\frac{(\alpha-\delta\gamma)}{\delta}T}}{\Gamma_4}\right] \quad \text{(A19)}$$

$$D(T) - D^* \equiv \eta(T) = M(T) - \delta^{\frac{1-\epsilon}{\epsilon}} (\alpha Z_M)^{-\frac{1}{\epsilon}} e^{-\frac{\rho}{\epsilon}T} \tag{A20}$$

$$= \left[\frac{M_0}{\delta} + \frac{\alpha D^*}{\alpha-\delta\gamma} \right] e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)T} - \frac{\alpha D^*}{\alpha-\delta\gamma} + \frac{(\alpha Z_M)^{-\frac{1}{\epsilon}} \delta^{\frac{1-\epsilon}{\epsilon}}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T}\right] - \frac{\epsilon-1}{\delta\epsilon}\left[(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}\right] e^{-\frac{\rho}{\epsilon}T}}{(\alpha-\delta\gamma)+\frac{\delta\rho}{\epsilon-1}} \right] \tag{A21}$$

$$= \frac{\Gamma_1}{\delta} e^{\left(\frac{\alpha-\delta\gamma}{\delta}\right)T} - \frac{\Gamma_2}{\delta} + \frac{\frac{\Gamma_3}{\delta}}{\frac{\epsilon-1}{\delta\epsilon}} \left[\frac{\frac{\alpha}{\delta}\left[e^{-\frac{\rho}{\epsilon}T} - e^{\frac{\epsilon-1}{\delta\epsilon}(\alpha-\delta\gamma)T}\right] - \frac{\epsilon-1}{\delta\epsilon} \Gamma_4 e^{-\frac{\rho}{\epsilon}T}}{\Gamma_4} \right] \tag{A22}$$

where, $\Gamma_1 = M_0 + \frac{\alpha\delta D^*}{\alpha-\delta\gamma}$, $\Gamma_2 = \frac{\alpha\delta D^*}{\alpha-\delta\gamma}$, $\Gamma_3 = (\frac{\alpha}{\delta})^{\frac{\epsilon-1}{\epsilon}}(Z_M)^{-\frac{1}{\epsilon}}$ and $\Gamma_4 = \frac{\alpha\delta D^*}{\alpha-\delta\gamma}$

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