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Growth of government and the politics of fiscal policy

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Abstract

US government expenditures increased rapidly during the post-war period, then slowed in the 1980s and began falling in 1992. To examine the dynamics of the growth and subsequent reduction in government spending, we present a general equilibrium growth model in which politicians chose government spending to maximize support by their constituents. That is, output and government spending are endogenous and jointly determined. The model predicts that government expenditures will initially mimic Wagner's law—the tendency for government spending to increase with GDP—but eventually diverge from output due to the growth of the welfare state. After government expenditures become large, we identify an endogenous threshold on the economy's growth path where it is optimal for politicians to shrink the welfare state, cut taxes, and stimulate output growth. We show that the policies chosen by politicians are Pareto suboptimal and cause endogenous cycles in output. Such cycles are of several types, and we characterize when the equilibrium growth path will result in a reduction in the size of the welfare state, as well as when the welfare state cycles between small and large.

JEL classification: P16, political economy of capitalism; E62, fiscal policy; O40, economic growth

Keywords: Government expenditures; Growth; Wagner's law; Endogenous cycles

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The Senate neared approval of a revised five-year budget plan as GOP leaders scrambled to find savings to pay for constituent-pleasing measures. (*The Wall Street Journal*, *April 3*, *1998*.)

1. Introduction

Between 1929 and 2000 US real GDP grew at an average rate of 3.4% a year. During the same time period, real government outlays (federal, state and local) grew at an average of 3.2% a year. Writing in 1893, Adolph Wagner posited that increased political pressures would accompany the development of modern industrial societies, giving rise to a continual expansion of the public sector. When government spending grows faster than output, 'Wagner's law' is said to hold. Empirical tests of Wagner's law for developed countries affirm its existence.[1] Modern explanations for this finding range from extensions of the franchise which reduced the income of the median voter and increased transfers (Meltzer and Richard, 1981; Husted and Kenny, 1997) and enfranchised women (Lott and Kenny, 1999), to legislative self-oversight (Miller and Moe, 1983) and increasing centralization (Borcherding, 1985), to more extensive government monitoring required in an increasingly complex economy (Chapell and Keech, 1985) and a complicated tax structure (Becker and Mulligan, 1998), to the role of government agencies and size of bureaucracy (Wilson, 1989), to an aging population which increased transfers (Azariadis and Lambertini, 1997).[2] The *raison d'être* of this paper is that the sources of government growth cannot be understood without examining the motivations of those setting policy. Further, policy determination must account for the interdependence between fiscal policy and output growth.

Conducting empirical tests for the period 1929–2000, we show in Section 2 that Wagner's law does not hold for the US. Fig. 1 informally demonstrates this by plotting aggregate real government expenditures—not including defense expenditures—as a percentage of real GDP.[3] The figure partitions the data into four distinct regions. Though the data are noisy before WWII, Wagner's law appears to hold from 1945 to 1975. This relationship starts to breakdown after 1975 as government spending slowed markedly while output growth accelerated, invalidating the presumed co-movement between them. More starkly, US aggregate govern-

[1] See Henrekson (1990) for a survey of the empirical literature on Wagner's law as well as Ram (1987), Gemell (1990), and Bohl (1996).

[2] An extensive survey of explanations for the growth in government can be found in Holsey and Borcherding (1997).

[3] In Fig. 1, aggregate real government expenditures constitute the sum of federal, state, and local government consumption and investment expenditures plus transfers. The data are adopted from Tables 1.1, 3.1, 3.7, and 3.12, and 7.1 from the National Income and Product accounts.

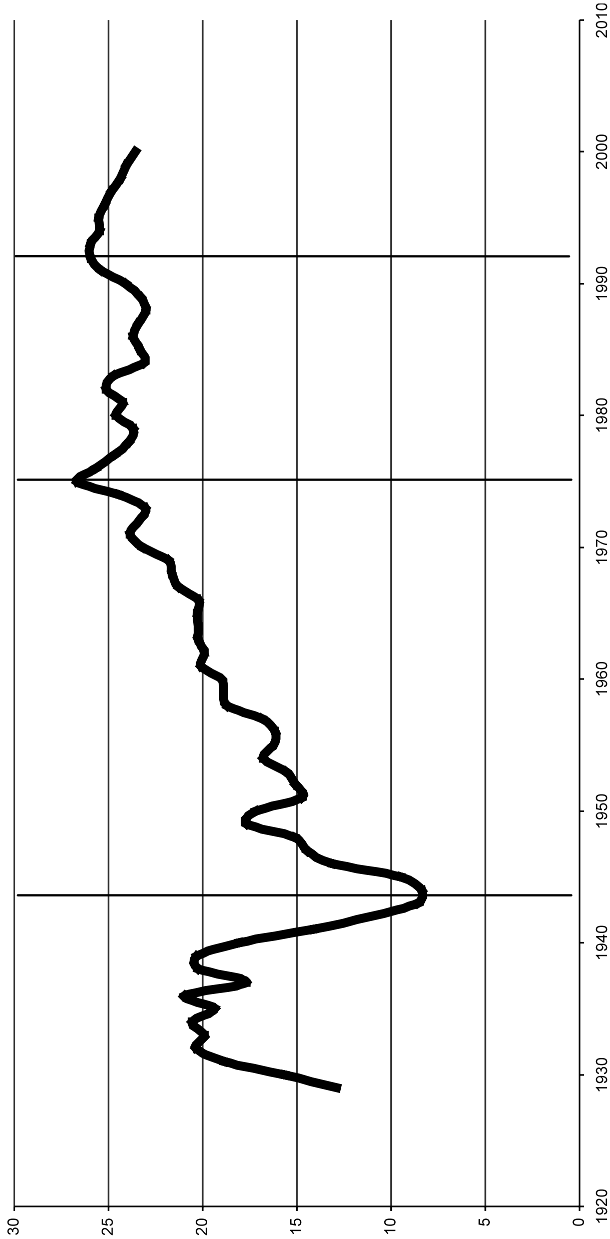

Fig. 1. The ratio of real non-defense government expenditures to real GDP, 1929–2000.

ment expenditures began to fall in 1992, with this decline continuing through the present, while output growth during the 1990s was extraordinarily high.

Taking the trend depicted in Fig. 1 as a point of departure, this paper constructs a political theory of the composition of government expenditures within a neoclassical growth model to explain the pattern of aggregate government expenditures. The theory shows that over subperiods, Wagner's law holds as the growth of the 'welfare state' exceeds output growth.[4] We demonstrate that after government expenditures become a large proportion of the economy, a threshold emerges at which politicians optimally reduce the size of the welfare state—at least temporarily—in order to maintain positive output growth. The model thus predicts an endogenous switch in the time trend of government expenditures, just as US data show. The catalyzing factor driving these results is the choice by politicians of both the level and composition of government expenditures which is made to maximize support from their constituents. When politicians set policy, we show that the size of the welfare state oscillates. We characterize the sources and types of oscillations, and show that after the welfare state shrinks, there are strong incentives for its subsequent growth.

Comparing the equilibrium dynamics induced by politically motivated policy-setting to Pareto optimal policies and constant policies, we show that political policies not only are Pareto-suboptimal, but result in distinctly different dynamic paths for the economy. Indeed, Pareto optimal policies produce endogenous growth in which the economy never reaches a steady state, while politically motivated policies and constant policies lead to steady states in per capita income. Perhaps most interestingly, political incentives cause the equilibrium path of the economy to exhibit cycles. Output oscillations arise in an economy that would otherwise have a monotone growth path, and are the direct result of politically motivated policy-setting.

The paper is structured as follows. Section 2 discusses the results of cointegration tests of real US government expenditures and GDP. These tests reject Wagner's law which motivates the model of policy-setting in a dynamic economy presented in Section 3. In Section 3 we derive politically-motivated policy choices and characterizes both the aggregate impact of such policies and the size of the welfare state. Section 4 draws implications from the analysis and concludes.

2. Motivation

This section tests whether Wagner's law is borne out in the US using annual data from 1929 to 2000. We include this test to motivate a theoretical model that explains and (predicts) not only the secular growth of government, but also downturns, and cycles.[5] In the analysis, G denotes the natural logarithm of

[4] We use the term 'welfare state' to denote the proportion of government expenditures spent on redistributive transfers.

[5] Although alternative formulations of Wagner's law may lead to different empirical findings, our purpose is to not provide an exhaustive empirical test of the incidence of Wagner's law in the US. See Henrekson (1990), and Park (1996) for a detailed survey of the various interpretations of Wagner's law.

non-defense aggregate annual real government expenditures inclusive of real transfers,[6] while Y denotes the natural logarithm of annual real US GDP. We exclude defense expenditures from G to eliminate variation in the series due to wartime spending accelerations and decelerations. Since our model constructs a political theory of *aggregate* real government spending, we test Wagner's law in aggregates: i.e. we utilize the Peacock and Wiseman (1961) and Pryor (1968) formulations.[7] Focusing on aggregates also eliminates the influence that population size has on the empirical results (Borcherding, 1985), and tightens the link between the theoretical model that follows and the empirical motivation.

The validity of testing for Wagner's law using traditional regression analysis is questionable because non-stationary data produce spuriously significant regression coefficients (Granger and Newbold, 1974). Specifically, if real public spending and real income are both integrated processes but not cointegrated, the estimated relationship may produce a 'false positive' in tests of Wagner's law (Engle and Granger, 1987).[8] To address these problems, a direct test of Wagner's law is the existence of a cointegrating or long-term relationship between G and Y provided that the series are stationary and integrated of the same order.[9] As Ram (1992, p. 497) and Henrekson (1993, pp. 406-407) point out, interpreting Wagner's law as a long run equilibrium relationship is consistent with Wagner's original postulate regarding the existence of a long run relationship between economic development and size of the public sector.

Following the reasoning above, we write the basic empirical specification between G and Y as

$$G_t = \beta_1 + \beta_2 Y_t + \varepsilon_t$$

where $\varepsilon \sim \mathrm{WN}(0, \sigma^2)$. If Wagner's hypothesis holds, the time series G and Y are I(1), and the estimated residuals, $\hat{\varepsilon}$, must be I(0). G, excluding transfers, is obtained

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[6] We follow Beck (1992) in deflating transfers by the implicit price deflator for personal consumption expenditures.

[7] Our formulation of Wagner's law is closest to Peacock and Wiseman since optimal policy choices (i.e. the choice over the components of public spending) lead to the determination of aggregate public spending in our model. In Pryor (1968), aggregate government spending is synonymous with consumption expenditures.

[8] However, as shown by Sims et al. (1987), and discussed in Henrekson (1990), a regression which includes regressors that are integrated processes may still give consistent estimates under two conditions. First, if the regression equation can be expressed in a way so that all the coefficients of interest became coefficients on mean zero stationary variables. Second, if the integrated dependent variable is cointegrated with one of the variables, so that the error in the regression equation is stationary but not necessarily uncorrelated of the regressors. For our model, the first condition is clearly not fulfilled, and as the cointegration exercise indicates, neither is the second. For this reason, we don't report the traditional elasticity estimate of income on government spending.

[9] Testing for Wagner's law using a cointegrating exercise is now widespread in the literature: for instance, see Bohl (1996), Murthy (1996), Park (1996), Lin (1995), Ashworth (1994), Hayo (1994), and Henrekson (1990).

Table 1
ADF test of integration of data series

Variable X	ADF for unit root in X	Lags	ADF for unit root in ΔX	Lags
G	−2.045063	2	−5.287751[a]	1
Y	−3.153275	2	−4.976698[a]	1

[a] Denoting significance at the 1% level.

Table 2
Johansen and Juselius cointegration tests between G and Y, 1929–2000

Eigenvalue	L.R. Stat.	5% Crit. Val.	Hypo. No. of C.E's
0.1703	14.92302	25.32	None
0.029140	2.040530	12.25	At most 1

from Tables 1.2 (Lines 20, 22), 3.7 (Line 1), National Income and Product Accounts; Y is obtained from Table 1.2 (Line 1), National Income and Product Accounts; the implicit price deflator for personal consumption expenditures is obtained from Table 7.1 (Line 8), National Income and Product Accounts; and the data for transfers is obtained from Table 3.12 (Line 1), National Income and Product Accounts. Our approach—using annual data from 1929 to 2000—extends the results of Bohl (1996) who performs a cointegration test on annual data from 1959 to 1996. Using a longer time span, our results confirm the disappearance of Wagner's law.

Using an Augmented Dickey-Fuller (ADF) test, we first determine the order of integration of G and Y. Table 1 summarizes the results of the ADF test for unit roots in G and Y. The table shows that both G and Y have unit roots in levels, but not in first differences. A Phillips-Perron test of the order of integration confirms this finding. Therefore, G and Y are both integrated of order 1.[10] Finally, following Perron (1989), the null of a unit root is not rejected for both G and Y when we test for structural breaks in the data.

To examine if G and Y are cointegrated, we use the Johansen maximum likelihood approach (Johansen, 1988; Johansen and Juselius, 1990). Table 2 summarizes the results of cointegration tests using the trace and maximum eigenvalue statistics. The cointegrating estimation includes a deterministic trend as the unit root tests show both a unit root and a statistically significant linear trend.[11]

[10] The ADF test for a unit root in levels are based on $\Delta X_t = \alpha + \beta t + (\rho - 1)X_{t-1} + \Sigma_{i=1}^{n}\lambda_i \Delta X_{t-i} + \varepsilon_t$. Critical values for the ADF test are drawn from MacKinnon (1991). A constant and trend are included, using 69 observations in levels. The Phillips-Perron test uses a truncation lag of 2. The Phillips-Perron Test Statistic (PP) for G is −1.746 and is not significant at the 10% (−3.1635) level; the PP for Y is −2.5532 and is also insignificant at 10%. First differencing, the PP for ΔG is −7.152862, and the PP for ΔY is −4.87703, both being significant at the 1% level.

[11] Even without a trend in the cointegration space, we are unable to reject the null of no cointegrating vectors between G and GDP at the 5% significance level. For the null of no cointegrating vectors, the likelihood ratio statistics are 13.56549 compared to 15.41 (5% level). For the null of at most one cointegrating vector, the likelihood ratio statistic 1.259847 compared to 3.76 (5% level).

Using the eigenvalues in column 1, a test of cointegration with the trace statistic fails to reject the null of both of the following hypotheses at the 5% level: (1) zero cointegrating vectors, $H_0{:}r = 0$, against the alternative of one or more cointegrating vectors, $H_A{:}r > 0$; and (2), $H_A{:}r \leq 1$, versus $H_A{:}r > 1$, or the existence of one cointegrating relationship. Further, using the maximum eigenvalue statistic to test the null of no cointegrating vectors, we fail to reject the null at the 1% level.[12] Thus, the tests show no statistical support for a long-term relationship between real annual government expenditures and real annual GDP in the US between 1929 and 2000.

Not only do government spending and output lack a long-run relationship, but US government spending has been *declining* since 1992 while GDP has grown. Specifically, real government expenditures (inclusive of transfers) as a percentage of GDP fell from approximately 27% in 1975 to 23% in 2000.[13] In the next section, we offer a political explanation for both the growth *and* reduction in the size of government. Further, we show that government growth and its eventual shrinkage are driven by the size of the welfare state.

3. Politicians and policy

Because politicians determine government expenditures, fiscal flows reflect their objectives. In particular, we model politicians as choosing a set of fiscal policies to maximize the support of their constituents.[14] One way that politicians maintain constituent support is to raise voters' incomes through enacted policies. There is robust empirical support showing that politicians are more likely to be re-elected when the economy is growing, and when enacted policies have a positive impact on individuals' incomes. Lewis-Beck (1990, p. 157) writes 'Shifting economic evaluations can make or break incumbents in a re-election bid…modest shifts in the percentage of voters who see worsening economic conditions can easily cost the incumbent 3 to 5 percent of the total popular vote.' Lewis-Beck shows that voters consistently report that economic issues are the most important factor affecting their choices in elections. Secondarily, voters evaluate the impact of policies on their own incomes. Surveys also indicate that politicians set policy (and claim credit for policies) presuming that voters care about the health of the economy (Fiorina, 1981; Tufte, 1978).

[12] The critical values are from Osterwald-Lenum (1992). Inclusion of the maximum eigenvalue test supports the no cointegration result because of the low power feature of the trace statistic test (see Johansen and Juselius, 1990, p. 9).

[13] When defense expenditures are included in government spending and nominal magnitudes considered, the decline in the G/Y ratio is even more dramatic: government spending as a percentage of GDP falls from 33% in 1975 to 27% in 2000. However, most of this decline started in the mid-eighties with absolute declines occurring first in 1992.

[14] That politicians set policy in their own interests is consistent with a large literature in the public choice tradition, as surveyed in Mueller (1989).

We focus on two policies chosen by politicians that affect consumers' incomes: government investment that raises output growth as in Barro (1990), and direct transfers to citizens i.e. 'pork' for a politician's state or district. We assume that consumers use the same criteria in evaluating politicians and, to keep the model tractable, that politicians themselves are identical.[15] Under these assumptions, politicians can be considered a unitary actor in setting policies.

Each period, which can be considered an election cycle, policy-makers choose lump-sum taxes, τ, government investment, λ, and transfers, σ, that most closely align with the preferences of consumers. Consumers in this world are presumed to have fiscal illusion, as in Buchanan and Wagner (1977), Logan (1986) and Oates, 1988. Fiscal illusion arises because of the complexity of government tax and spending programs. Alesina et al. (1997, p. 31) write 'The government budget, …[and] its composition are sufficiently obscure and complicated that significant short-run informational asymmetries are quite likely.' Because of incomplete information, consumers do not comprehend the relationship between policies and taxes. Fiscal illusion is captured in the model by having consumers evaluate politicians solely on output growth and the transfers they receive.

We now formalize this discussion. Consider a single good, one-sector growth model in which politicians set policy to maximize constituent support, subject to a resource constraint and a revenue constraint. As discussed above, constituent support rises when income grows and transfers increase. Public investment raises private productivity which, in turn, raises output and consumption. In a one good economy, the malleability of capital into output and consumption means that growth in one of these indicates growth in the others. Because the capital stock, K, is the state variable for this economy, the most straightforward way to model the growth aspect of politicians' decision calculus is to have them maximize over growth of the capital stock, K_{t+1}/K_t. This construction obviates the need for politicians to know consumers' utility functions; rather they need only observe the state of the economy, K_t, when making policy choices at time t, following the work in economic politics (Lindblom, 1993).[16] We show below that policy choices completely determine aggregate income and consumption.

The second aspect in the political decision problem is the value constituents place on receiving transfers from the government, $V(\sigma)$. The function $V(\sigma)$ is continuous,

[15] Through this simplification we ignore many interesting micro-level issues in policy determination, such as agenda-setting, logrolling, rent-seeking and interest groups which may affect policy setting. The process of choosing policies is discussed in Baumgartner and Jones (1993), Lindblom (1993), Kingdon (1995), and Parker (1996). We assume that all politicians are on the same election cycle, and ignore term limits. Optimal policy choices can be viewed as an equilibrium strategy as part of a competitive political process as in Denzau and Munger (1986).

[16] Lindblom (1993) discusses the role of the executive branch has at setting the fiscal agenda, and attributes the limited set of government goals to 'opinion homogeneity' (p116ff). In the model here, there is complete agreement by policy-makers of the goals to pursue and the instruments used to achieve these goals. Actual policy-makers are unlikely to have the luxury of complete and unbiased information (Lindblom, 1993, p. 19).

strictly increasing and concave, and is the manifestation of fiscal illusion. Voters in this model have a 'systematic misperception of fiscal parameters' (Oates, 1988), as transfers themselves are valued, rather than simply the utility from consuming goods. This drives the politics of redistribution in the model. Politicians' preferences for transfers relative to capital growth are captured by the parameter, χ, with politicians' value placed on transfers being $\chi V(\sigma)$. Higher values of χ indicate a greater inclination by policy-makers to engage in redistribution vis-a-vis productive public investment. When $\chi = 0$, fiscal illusion disappears.

Combining the two objectives of politicians, the fiscal policy set $\{\tau_t, \sigma_t, \lambda_t\}_{t=0}^{\infty}$ is found by solving

$$\text{Max}_{\tau,\lambda,\sigma} \frac{K_{t+1}}{K_t} + \chi V(\sigma_t) \tag{1}$$

s.t.

$$C_t + I_t = F(K_t, (1-\gamma_2)\lambda_t) - \tau_t + (1-\gamma_1)\sigma_t \tag{2}$$

$$I_t = K_{t+1} - (1-\delta)K_t \tag{3}$$

$$\tau_t = \lambda_t + \sigma_t \tag{4}$$

given $K_0 > 0$, and where the number of consumers is constant and normalized to unity. Eq. (2) is the economy's resource constraint equating consumption, C, net of taxes and transfers, and investment, I, to the output produced using a neoclassical production function $F(\cdot, \cdot)$. Eq. (3) is the stock accounting condition for the private capital stock, K, with $\delta \in [0, 1]$ the depreciation rate. Eq. (4) is the government budget constraint in which taxes finance expenditures on transfers and public investment in each period. Because government programs are not costlessly run, γ_1, $\gamma_2 \in (0, 1)$ are the proportional costs of administering the transfer and government investment programs, respectively. To keep the model tractable, government investment does not accumulate and government borrowing is disallowed.[17]

It will be useful to define the level of transfers relative to government investment as $\theta \equiv \sigma/\lambda$. Then, we can rewrite the government revenue constraint as

$$\tau_t = (1 + \theta_t)\lambda_t \tag{5}$$

[17] Government borrowing is primarily driven by spending (correlation > 0.95, Hayakawa and Zak, in press) so its inclusion would add little to the analysis. The lack of accumulation of public investment can be understood as a 100% depreciation rate on public projects. If λ does accumulate over time, with Λ the stock of public capital, a well-defined political fiscal policy problem would maximize output growth and transfers, $\text{Max}_{\tau,\lambda,\sigma} \frac{K_{t+1}}{K_t} + \chi V(\sigma_t)$, under constraints Eq. (2), Eq. (3), Eq. (4), and subject to a law of motion for public capital, $\Lambda_{t+1} = \lambda_t + (1-\delta)\Lambda_t$. The difficulty with such a set-up is that using the standard function forms, a closed from solution for optimal fiscal policies does not exist. In order to make the model as clear as possible, we therefore limit our analysis to the case in which public capital does not accumulate as in Barro (1990), and show that this simpler model provides significant insights into the dynamics of fiscal policy and economic growth.

Using Eq. (5), we can conveniently examine the composition of government programs. In order to concretize the analysis, we use a Cobb-Douglas production function,

$$F(K_t,(1-\gamma_2)\lambda_t) = K_t^{\alpha}[(1-\gamma_2)\lambda_t]^{1-\alpha}, \tag{6}$$

for $\alpha \in (0, 1)$ and let preferences over transfers be represented by a power function,

$$V(\sigma_t) = \sigma^{v} \tag{7}$$

with $v \in (0, 1)$.

The first order conditions produce state-dependent policies given by[18]

$$\lambda_t^* = (1-\alpha)^{\frac{1}{\alpha}}(1-\gamma_2)^{\frac{1-\alpha}{\alpha}}K_t \tag{8}$$

$$\sigma_t^* = \left[\frac{v\chi}{\gamma_1}\right]^{\frac{1}{1-v}} K_t^{\frac{1}{1-v}} \tag{9}$$

$$\tau_t^* = \sigma_t^* + \lambda_t^* \tag{10}$$

$$\theta_t^* = \left[\frac{v\chi}{\gamma_1}\right]^{\frac{1}{1-v}} (1-\alpha)^{\frac{-1}{\alpha}}(1-\gamma_2)^{\frac{-1+\alpha}{\alpha}} K_t^{\frac{v}{1-v}} \tag{11}$$

Optimal government policies at time t are functions of the state variable, K_t as in Grossman and Helpman (1998) and Krusell et al. (1997).

These optimality conditions reveal the trade-offs faced by policy-makers. The first condition, Eq. (8), shows that government investment grows in proportion to the capital stock. When the capital stock is growing, government investment increases in lock-step, with the constant of proportionality reduced when the cost of administering this program rises. Optimal government investment generally falls when the productivity of private capital, α, rises as politicians optimally reduce taxes to allocate more revenue to private capital.[19]

Politicians' optimal level of transfers, given by Eq. (9), grows faster than the capital stock since $v > 0$. As politicians become less inclined to pursue redistributive policies, i.e. $\chi \to 0$, Eq. (9) shows that the politically optimal level of transfers approaches zero. Lastly, Eq. (10) reveals that, due to transfers, taxes grow faster than the capital stock.

We examine the implications of politically motivated policy-setting for the growth in government by defining g as government spending relative to output, $g(K_t) \equiv \tau_t^*/Y_t$. For $v = 1/2$, g increases exactly proportionally to output so that Wagner's law holds exactly. If politicians' support from providing transfers is sufficiently strong ($v > 1/2$), then $g(K_t)$ is convex in K_t. In this case, government spending relative to output grows rapidly as the welfare state expands. It is

[18] It is straightforward to verify that the solution is a maximum via the second-order conditions.

[19] Formally, $\frac{\partial \lambda^*}{\partial \alpha} < 0$ if $\gamma_2 < 1 - \frac{e^{\frac{-\alpha}{1-\alpha}}}{1-\alpha}$.

straightforward to show that g is also convex in the other political preference parameter, χ.

The following theorem characterizes the welfare properties of government policy $\{\tau_t^*, \sigma_t^*, \lambda_t^*\}_{t=0}^{\infty}$ derived above. Note that since government programs have dead-weight administrative costs $\gamma_1, \gamma_2 > 0$, all policies are, at best, second-best outcomes. We will call second-best policies *constrained Pareto optimal*. The next theorem compares the policies chosen by politicians with constrained Pareto optimal policies.

Theorem 1. When politicians have preferences over capital deepening and transfers as in model (1), the government policy triple $\{\tau_t^*, \sigma_t^*, \lambda_t^*\}_{t=0}{}^{\infty}$ given by Eqs. (8), (9) and (10) is not constrained Pareto optimal.

A lemma will be helpful in proving this theorem.

Lemma 1. Suppose that all agents in the economy are identical and infinitely lived. Then, the level of government investment $\{\lambda_t^*\}_{t=0}^{\infty}$ given by Eq. (8) when transfers are zero is constrained Pareto optimal.

Proof. The constrained Pareto optimal level of government investment is the solution to

$$\text{Max}_{\lambda,\tau} \Sigma_{t=0}^{\infty} \beta^t U(C_t)$$

s.t.

$$K_{t+1} = F(K_t, (1-\gamma_2)\lambda_t) + (1-\delta)K_t - C_t - \tau_t$$

$$\tau_t = \lambda_t,$$

where $U(C)$ is a smooth representation of preferences with the usual properties. In order to match the policy from this problem with the solution to the politician's problem, we use the Cobb-Douglas production function given by Eq. (6). Solving this problem produces Eq. (8) for λ as claimed.

Now we proceed to prove Theorem 1.

Proof. Lemma 1 shows that government investment, λ^*, from the constrained Pareto problem and the politician's problem are identical, but taxes are not, since transfers are non-zero. Define net-of-tax income in the case where politicians choose policy to be $\overline{Y}_1 \equiv K^\alpha[(1-\gamma_2)\lambda^*]^{1-\alpha} + \sigma^*(1-\gamma_1) - \tau^*$. Similarly, let net income in the Pareto problem be $\overline{Y}_2 \equiv K^\alpha[(1-\gamma_2)\lambda^*]^{1-\alpha} - \lambda^*$. Using the expressions for λ^* and σ^* given in Eq. (8) and Eq. (9) and assuming that private investment is identical under each policy regime, it is straightforward to show that $\overline{Y}_2 > \overline{Y}_1$ for any value of $K > 0$. Therefore, consumption under the politicians' policy set is less than the Pareto optimal level of consumption, and politicians' policy set is not constrained Pareto optimal.

Note that the suboptimality of fiscal policy holds even if policies can be administered costlessly i.e. $\gamma_1 = \gamma_2 = 0$. With non-trivial administrative costs, the waste component of transfers simply exacerbates the suboptimality of fiscal policy. The theorem shows that net income falls because of the desire by politicians to spend tax revenue on transfers rather than limit government programs to those that raise private productivity. The welfare 'wedge' (net of administrative costs) is exactly the transfer. This is a direct result of voters' fiscal illusion. Although transfers are not Pareto optimal, we do observe a quite large level of transfers by governments (discussed below), and fiscal illusion may be one reason for this. The finding that government policies are suboptimal is consistent with the model of transfers and public investment of Besley and Coate (1998) where suboptimality follows because expenditure plans are not binding on future administrations. Our result obtains for policies that are fixed rules but when politicians set policies to maintain constituent support.[20]

4. The dynamics of politically motivated policies

In this section, we characterize the dynamics of an economy in which politicians set policy. The aggregate implications of such policies are compared to constrained Pareto optimal policies as well as outcomes with constant policies. In order to keep the dynamics tractable, we consider an economy in which savings is a fixed proportion of income, as in Solow (1956).

The capital market equilibrium condition is given by

$$K_{t+1} = s\bar{Y}_t + (1-\delta)K_t \tag{12}$$

where $s \in (0,1)$ is the savings rate, and $\overline{Y}$ is income net of taxes and transfers. Using the optimality conditions for politicians, Eqs. (8), (9) and (10), the dynamical system for the economy, which we call the *political economy*, is given by

$$K_{t+1} = s\left[AK_t - BK_t^{\frac{1}{1-v}}\right] + (1-\delta)K_t \tag{13}$$

where $A \equiv \alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}(1-\gamma_2)^{\frac{1-\alpha}{\alpha}} > 0$ and $B \equiv (v\chi)^{\frac{1}{1-v}}\gamma_1^{\frac{-1}{1-v}} > 0$. The first term in the brackets of Eq. (13) captures the effect on output of the complementarity of private capital and public investment, producing a term which is linear in K. The second term in brackets is taxes net of transfers.[21]

As benchmarks, consider two other versions of the Solow model. The first is the case in which government investment, λ is a constant, which we may take as unity.

[20] The suboptimality of government policies is often found in political models. See, for example, Buchanan (1972) or Dixit and Londregan (1995).

[21] To guarantee that the dynamics are nontrivial, we impose a condition on the depreciation rate, $\delta < s\alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}(1-\gamma_2)^{\frac{1-\alpha}{\alpha}}$.

We will call this the *standard Solow economy*, as this is simply the Solow (1956) model. The equilibrium dynamics of this model are given by

$$K_{t+1} = s(1-\gamma_2)^{1-\alpha}K_t^{\alpha} + (1-\delta)K_t \tag{14}$$

when production is Cobb-Douglas. This model has a unique, stable interior steady state.

The second benchmark model arises when the government policy is constrained Pareto optimal, as given by Lemma 1 (it is straightforward to show that the Pareto solution sets transfers to zero). The dynamical system for this model, which we call the *Pareto optimal economy*, is

$$K_{t+1} = sAK_t + (1-\delta)K_t \tag{15}$$

where A is defined above.

Observe that the Pareto optimal government policy transforms the standard Solow model into a linear model, known as the AK model.[22] This economy produces endogenous growth without reaching a steady state, even though production exhibits constant returns to scale. Endogenous growth arises because private and public capital are complements in production, and obtains even when there are costs to administering government investment programs ($\gamma_2 > 0$).

Now we characterize the dynamics of the political economy relative to the two benchmark economies. First, observe that the political economy collapses to the Pareto optimal economy as fiscal illusion disappears; that is, as $\chi \to 0$. From a political perspective, if citizens do not vote for politicians based on the transfers they receive, but base their support only on income growth (or equivalently, lifetime utility maximization), optimal policies result in endogenous growth. In this case, Wagner's law holds exactly for all time as output growth and government spending are proportional to each other. When $\chi > 0$, the next result, which is the primary finding of this paper, demonstrates that the dynamics of the political economy can be quite complicated.

Theorem 2. Define $K_T = \text{ARGMAX}_{Kt}K_{t+1}$, where K_{t+1} is given by dynamical system Eq. (13) in which politicians choose government investment and transfers. If $v > 1/(sA + 1 - \delta)$, then $K_T < \overline{K}$ where $\overline{K}$ is the unique interior steady state of the economy.

Under the provisions of Theorem 2, if politicians' preferences over transfers are sufficiently strong, the political economy has a unique interior steady state. But, the implications of this theorem are in fact much stronger. When the capital stock is below the threshold level K_T, Theorem 2 indicates that Wagner's law holds approximately over a range of the capital stock (0, K_T). That is, aggregate government expenditures and output grow at close to the same rate during an initial growth phase of the economy. Because transfers grow slightly faster than

[22] We assume that $sA + 1 - \delta > 0$ so that the dynamics are nontrivial.

output, government spending eventually becomes so large in absolute terms that the drag from taxes to fund the welfare state causes the economy to exceed the threshold K_T. If government policy continues unchanged after the economy reaches K_T, the capital stock shrinks, and output and consumption fall.

When the economy reaches the threshold K_T, a change in politicians' policy determination problem is required to maintain positive output growth—without a change, there is no solution to the optimal policy problem model (1). Output growth is stimulated by reducing the weight placed on transfers, χ, thereby cutting transfers by Eq. (9) and taxes by Eq. (10), increasing the funds available for private investment. The value of χ changes, for example, when a different political party is elected to run the government. The model thus predicts an endogenous switch in the amount and composition of government expenditures. After a period of growth, the size of the welfare state and taxes both begin to decline in order to keep the economy growing. Theorem 2 demonstrates that the model replicates the break in US data in 1992 when government expenditures began to shrink.

After growth picks up following a reduction in transfers, politicians return to solving the original policy problem (Eq. (1)), using the lower value of χ. While policies based on a lower value of χ stimulate positive output growth over an interval of the capital stock, if $\chi > 0$ eventually another no-growth threshold will be reached. At this new threshold, positive output growth requires another cut in χ, which decreases relative transfers and taxes yet again. Note that the absolute value of transfers generally grows between the cuts in χ because output growth increases tax revenue. The reduction and then increase in the absolute value of transfers induces *pseudocycles* in aggregates, as output falls, policy changes, and then growth restarts and transfers increase until another threshold is reached. Fig. 2 depicts the time-series of these pseudocycles. The model thus predicts that after a shrinking of the welfare state, government growth will again pick up due to the incentives politicians have to send transfers to their constituents.

Fig. 3 presents phase portraits of all three variants of the model. The political economy is shown with the maximum value of the capital stock K_T prior the steady state as in Theorem 2. The other two growth paths correspond to the standard Solow model and the Pareto optimal economy, with the latter having a balanced growth path. The figure illustrates the effect of a fixed value of $\chi > 0$ for the political economy. The figure clearly shows the output loss that result from politically motivated policy-setting.

Many scholars have argued that politicians' ideologies affect the composition of government expenditures (Frey and Lau, 1968; Melisi-Ferretti and Spolaore, 1997). For example, Alt et al. (1983) find that Labour governments in Great Britain provide more transfers than do Conservative governments. The model here shows that the ideological bent of politicians can also cause fluctuations in aggregate output. Specifically, the following two results demonstrate that if politicians sufficiently value transfers (i.e. v is sufficiently large), then the equilibrium path of the economy cycles endogenously.

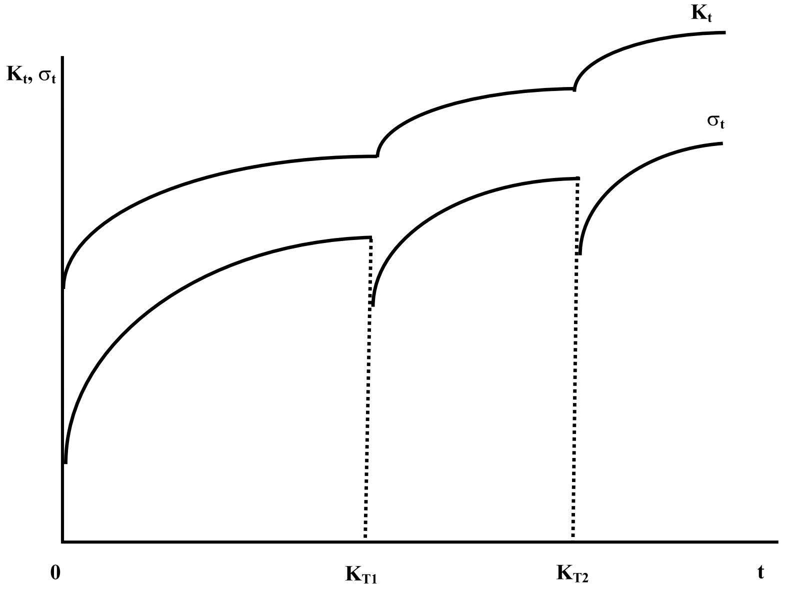

Fig. 2. Pseudocycles in transfers and capital stock.

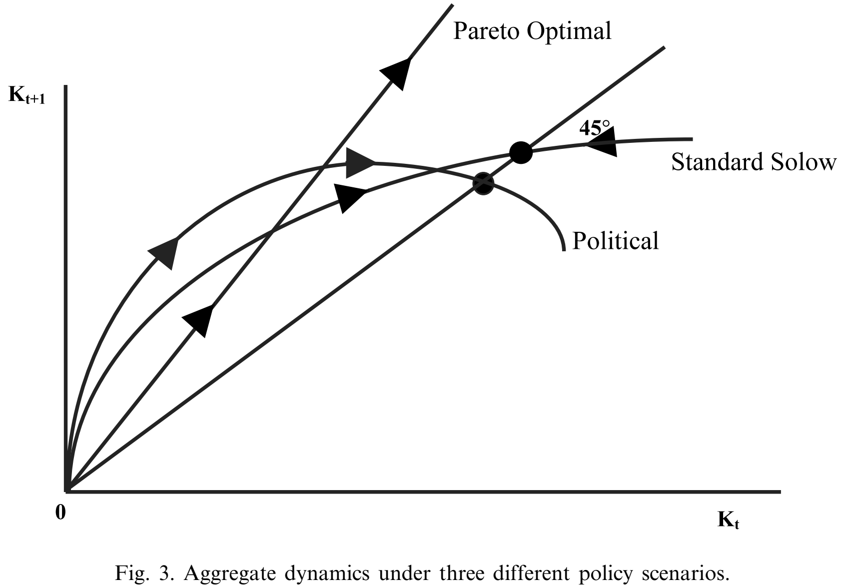

Fig. 3. Aggregate dynamics under three different policy scenarios.

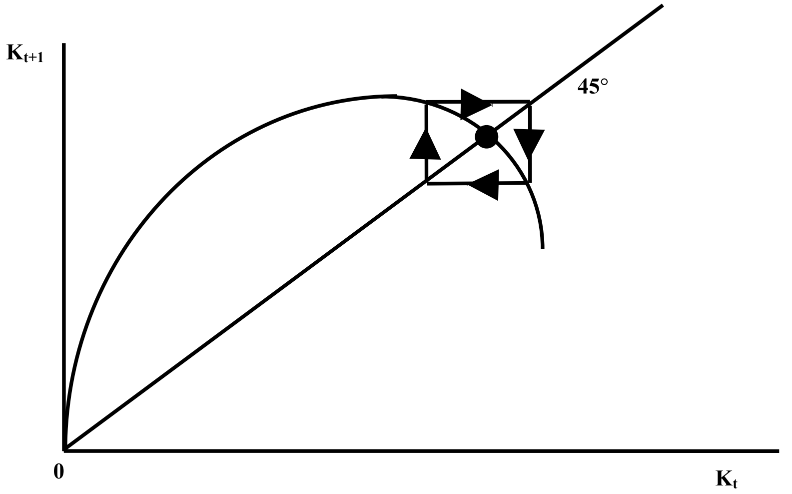

Fig. 4. Policy-induced cycles.

Theorem 3. If $1/(sA+1-\delta) < v < 1$, all dynamic equilibria of the political economy (Eq. (13)) are cyclic.

Proof 3. The equilibrium path is cyclic if the eigenvalue of the local approximation of the system about the steady state is negative. This eigenvalue, e, which is always real, is given by $e = (1 - v(sA + 1 - \delta))/(1 - v)$. The restriction in the theorem guarantees that $e < 0$.

Corollary 1. Let $sA > \delta$. Then if politicians have sufficiently strong preferences for transfers, $v > 2/(sA + 2 - \delta)$, the equilibrium path of the economy is cyclic and explosive.

The implications of Theorem 3 and Corollary 1 are quite powerful: the desire by politicians to be re-elected induces cycles in an economy that would otherwise have a monotone growth path (either converging to a steady state or to a balanced growth path). *A fortiori*, if politicians' proclivity to offer their constituents transfers is sufficiently large, the resulting cyclic growth path exhibits increasing variance, destabilizing the economy.[23] Note that Corollary 1 suggests that 'leftist' governments (higher values of v) are more likely to destabilize their economies through high transfers.

The next result shows that *periodic* cycles may also arise in the political economy.

Theorem 4. Under the restriction in Theorem 2, the political economy (Eq. (13)) admits a periodic cycle.

[23] The political model of redistribution by short-lived governments of Grossman and Helpman (1998) also admits cycles in output, through not in all cases as we find here.

Proof 4. A two-cycle exists if $\left.\frac{\partial K_{t+1}}{\partial K_t}\right|_{K_t=\bar{K}} = -1$. Clearly, this requires that the maximum value of K_{t+1}, which is denoted K_T in Theorem 2 is less than the steady state value $\bar{K}$. The restriction on v in Theorem 2 guarantees that this is the case. Next, substituting the value for $\bar{K} = \left(\frac{sA-\delta}{sB}\right)^{\frac{1-v}{v}}$ into the expression for $\frac{\partial K_{t+1}}{\partial K_t} = -1$, the critical value of v that makes this expression hold is found, which we will call v^*. Some algebra shows that $v^* = 2/(2-\delta+sA)$, which is well-defined for all admissible parameter values.

Corollary 2. The two-cycle in Theorem 4 is stable.

Theorems 3 and 4 and their corollaries extend the previous results by showing that not only can politically motivated policy-setting cause pseudocycles in the economy as politicians alter policies, but if transfers are sufficiently valued, endogenous cycles with fixed policy rules arise. Fig. 4 illustrates the aggregate dynamics of the political economy with a policy-induced periodic cycle. That cycles can be caused by politically motivated policies is consistent with the literature on political business cycles (Alesina et al., 1997; Lohmann, 1998; Mueller, 1989; Willett, 1988), but runs counter to the traditional apolitical literature that examines the government's ability to reduce the amplitude of cycles.[24]

5. Discussion and conclusion

The implications of the model in this paper taken as a whole demonstrate that policies that are optimal from politicians' point of view may be detrimental to the economy. These findings are consistent with the intuition that political incentives produce suboptimal policies, but the dynamics of this suboptimality that we find—the existence of thresholds and cycles—is indicative of the extent to which government policies affect aggregate economic dynamics. This is especially true since cyclic equilibria result in welfare losses (Suarez and Sussman, 1997; Susanto, 1995; Cooley and Hansen, 1992; Imrohoruglu, 1989).

Indeed, we demonstrate that the cycles the model produces have a purely political etiology. Though the empirical evidence for political business cycles in the US is weak overall, there is some evidence of such cycles in subperiods in the US, as well as in Britain (Davidson et al., 1992; Beck, 1992; Keil, 1988; Richards, 1986). Interestingly, if a period in the model is 2 years (the congressional election cycle), under Theorem 4 the model predicts a stimulation of the economy every fourth year, matching the 4-year US presidential election cycle.

More generally, the model predicts that when politicians choose fiscal policy, excessive transfers cause the welfare state to balloon. Eventually, the drag from

[24] Fiscal policy induced cycles, like those found here, also appear in the model of Cazzavillan (1996) as the result of public goods externalities.

taxes used to pay for transfers leads to spending reforms in which the welfare state is cut. Tanzi and Schuknecht (1997) provide evidence for this scenario for industrialized countries during the past 125 years. They document that '[a]fter World War II, and especially after 1960, …subsidies and transfers, especially in cash, were the driving force behind government growth' (pp. 399). To wit, in 1870 subsidies and transfers for the countries in their study were, on average, 1% of GDP, which amounted 10% of total government outlays. By 1980, subsidies and transfers made up 50% government spending in industrial nations, amounting to over 21% of GDP on average (Tanzi and Schuknecht, 1997, p. 399). We provide a political explanation for the changing composition and size of government expenditures. Tanzi and Schuknecht (1997) also show that those countries that have undertaken significant government spending reforms (especially New Zealand and Chile) have accomplished this primarily through cuts in subsidies and transfers.[25] Casual observation in the US and Western Europe reveals manifest efforts to cut transfers. While this accords well with the model's predictions, we have demonstrated that because of the incentives faced by politicians, large welfare states are unlikely to disappear.

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[25] Reductions in the size of government may be more diffucult in parlimentary than presidential governments. The micropolitical model of Persson et al. (2000) predicts that parliamentary governments engage greater redistribution vis-a-vis presidential governments; the empirical evidence supports this (Persson and Tabellini, 2000, p. 266).

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