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Growth of Government and the Politics of Fiscal Policy*

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Abstract

U.S 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 dynamic general equilibrium model in which politicians chose government spending to maximize support by their constituents. 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.

Keywords: Government Expenditures, Growth, Wagner's Law, Endogenous Cycles.

Journal of Economic Literature Classifications: **P16:** Political Economy of Capitalism; **E62:** Fiscal Policy; **O40** Economic Growth.

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 1947 and 1994 U. S. 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 (Meltzer & Richard, 1981), to more extensive government monitoring required in an increasingly complex economy (Chappel & Keech, 1985), to an aging population which increased transfers (Azariadis & 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 1947 to 1994, we show that Wagner's law does not hold for the United States. Figure 1 informally demonstrates this by

[1] See Henrekson (1990) for an up-to-date 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 & Borcherding (1997).

plotting real aggregate government expenditures and real GDP. Wagner's law appears to hold until the early 1970s, but this relationship starts to breakdown when government expenditures begin a rapid rise in 1974. By the late 1980s, the rate of increase government spending slowed markedly while output growth accelerated, invalidating the presumed proportionality between them. More starkly, U.S. aggregate government expenditures began to fall in 1992, with this decline continuing through the present.

[Figure 1 about here]

This paper constructs a political theory of the composition of government expenditures within a neoclassical growth model. The theory shows that over subperiods, Wagner's law holds as the growth of the "welfare state" exceeds output growth.[3] 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 U.S. 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 the support by 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

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

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 U.S 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. The model of Section 3 derives policies when the government is a unitary actor 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 An Investigation of Wagner's Law

This section tests whether Wagner's law is borne out in the U.S. from 1947 to 1994. We use quarterly real aggregate (as opposed to per-capita) data to maintain focus on the aggregate dynamics of fiscal policy choices. In the analysis, government consumption plus investment inclusive of outlays on defense, denoted G, measures aggregate public spending, while Y denotes real quarterly U.S. GDP.[4]

[4] See Henrekson (1990) for a detailed survey of the various interpretations of Wagner's Law. Our measure of G follows Bohl (1996) and is consistent with an early literature that examined Wagner's Law in aggregates (see Peacock & Wiseman, 1961; and Pryor, 1968). We perform a conservative test of Wagner's law by including defense spending in the measure of G. Using annual nominal data from 1959-1996, and a more inclusive measure of government expenditures, Bohl (1996) rejects Wagner's

Following Henrekson (1990), Murthy (1996), Ashworth (1994), Hayo (1994), and Lin (1995) the basic empirical specification between G and Y can be written as

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

where $\epsilon_t \sim WN(0, \sigma^2)$. A direct test of Wagner's law is the existence of a cointegrating, or long-term, equilibrium relationship between G and Y provided that the series are stationary and integrated of the same order. Using an Augmented Dickey-Fuller (ADF) test, we first determine the order of integration of G and Y. As the data in Figure 1 show no evidence of structural breaks, the analysis does not incorporate structural breaks in the unit root tests. Table 1 summarizes the results of the ADF test for unit roots in G and Y. The lags are chosen as the minimum lags that render the residuals white noise. 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.[5]

To examine if G and Y are cointegrated, we use the Johansen maximum likelihood approach (see Johansen, 1988, and Johansen & Juselius, 1990). Table 1 summarizes the results of cointegration tests using the trace and maximum eigenvalue statistics. We set VAR=2 as this yields the minimum multivariate AIC and SBC (see Enders,

Law in the U.S. Our analysis confirms this finding. G is obtained from Line 20, Table 1.2, National Income and Product Accounts, page 7-11; Y is obtained from Line 1, Table 1.2, National Income and Product Accounts, page 7-11.

[5] The ADF test for a unit root in levels are based on $\Delta X_t = \alpha + \beta t + (\rho - 1) X_{t-1} + \sum_{i=1}^{n} \Delta X_{t-i} + \epsilon_t$. Critical Values for the ADF test are drawn from MacKinnon (1991), with ^{a} denoting significance at the 1 % level. A constant and trend are included, using 189 observations in levels. The Phillips-Perron test uses a truncation lag of 2. The Phillips-Perron Test Statistic (PP) for G is -2.11303 and is not significant at the 1% (-4.008), 5% (-3.4342), or 10% (-3.148) levels; the PP for Y is -1.7616 and is also insignificant at these levels. Differencing, the PP for ΔG is -9.217, and the PP for ΔY is -10.04689, both being significant at the 1% level.

Variable X	ADF for Unit Root in X	Lags	ADF for Unit Root in ΔX	Lags
G	-2.069854	2	-4.668947^a	1
Y	-2.724039	2	-7.461976^a	1

Table 1: ADF Test of Integration of Data Series

1995, p.397).[6] The estimation includes a deterministic trend as the unit root tests show both a unit root and a statistically significant linear trend.

Eigenvalue	L.R Stat	5 % Crit.Val	Hypo. No. of C.E's
.057842	17.147	25.32	None
.030635	5.88	12.25	At Most 1

Table 2: Johansen & Juselius Cointegration Tests Between G and Y, 1947-1994

Using the eigenvalues in column 1, a test of cointegration with the trace statistic fails to reject the null of zero cointegrating vectors, $H_0 : r = 0$, against the alternative of one or more cointegrating vectors, $H_A : r > 0$, at the 95 % level. The second row in Table 2 tests the hypothesis of $H_0 : r \leq 1$ versus $H_A : r > 1$, or the existence of one cointegrating relationship. Since $5.88 < 12.25$, we fail to reject the null hypothesis of one cointegrating relationship at the 95 % level as well.[7] Further, using the maximum

[6]The Johansen (1998) method is based on the vector auto-regressive system of $n \times 1$ vectors of $I(1)$ variables X_t:$X_t = \mu + \Gamma_1 X_{t-1} + ... + \Gamma_p X_{t-p} + \epsilon_t$ where $\Gamma_1, ..., \Gamma_p$ are $n \times n$ matrices of coefficients, p is the lag length, and ϵ_t is an i.i.d Gaussian process. VAR=2 indicates the value of p in the cointegrating regression is 2.

[7]The non-rejection of the null using the trace statistic also holds at the 90 % level.

eigenvalue statistic to test the null of no cointegrating vectors, $H_0 : r = 0$, against the specific alternative, $H_A : r = 1$, we fail to reject the null of no cointegrating vectors at both the 90% level and 95% level.[8] Thus, the tests show no statistical support for a long-term relationship between real quarterly government expenditures and real quarterly GDP in the U.S.

Not only do government spending and output lack a long-run relationship, but U.S. government spending is currently *declining* while GDP grows. 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 is 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.[9] 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 reelected

[8]The critical values are read off from Osterwald-Lenum (1992). The computed value of $\lambda_{max} = -189 \ln(1 - .057842) = 11.26$. Using n=2 and r=0, the critical values at the 90 % level is 12.099 with the 95% level being 14.036. Since both tests indicate that the actual data generating process contain no cointegrating vectors, using wider confidence intervals increases the probability of incorrectly rejecting the null. Inclusion of the maximum eigenvalue test concretizes the no cointegration result because of the well known low power feature of the trace statistic test (see Johansen & Juselius, 1990, p.9).

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

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 reelection 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. Empirical evidence also indicates that politicians set policy (and claim credit for policies) presuming that voters care about the health of the economy (Fiorina, 1981; Tufte, 1978).

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.[10] Under these assumptions, politicians can be considered as 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 & Wagner (1977), Logan (1986) and Oates (1988).

[10]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 & Jones (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 & Munger (1986).

Fiscal illusion arises because of the complexity of government tax and spending programs. Alesina, Roubini & Cohen (1997) 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 perceive a one-to-one relationship between policies and taxes. Fiscal illusion is captured in the model by having consumers evaluate politicians based on both 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 budget 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, $\frac{K_{t+1}}{K_t}$. 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. We show below that policies 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, 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-á-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

$$Max_{\tau,\lambda,\sigma} \frac{K_{t+1}}{K_t} + \chi V(\sigma_t) \quad (1)$$

s.t.

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

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

$$\tau_t = \lambda_t + \sigma_t, \quad (4)$$

where the number of consumers is constant and normalized to unity. Equation (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 $F(\cdot,\cdot)$. Constraint (3) is the stock accounting condition for the private capital stock, K, with $\delta \in [0, 1]$ the depreciation rate. Equation (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, $\gamma_1, \gamma_2 \in (0, 1)$ 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.[11]

[11]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, $Max_{\tau,\lambda,\sigma} \frac{Y_{t+1}}{Y_t} + \chi V(\sigma_t)$, under constraints (2), (3), (4), and subject to a law of motion for public capital, $\Lambda_{t+1} = \lambda_t + (1-\delta)\Lambda_t$.

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

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

Using (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,

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

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

The first order conditions produce state-dependent policies given by[12]

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

$$\sigma_t^\star = [\frac{\nu\chi}{\gamma_1}]^{\frac{1}{1-\nu}} K_t^{\frac{1}{1-\nu}} \tag{9}$$

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

$$\theta_t^\star = [\frac{\nu\chi}{\gamma_1}]^{\frac{1}{1-\nu}}(1-\alpha)^{\frac{-1}{\alpha}}(1-\gamma_2)^{\frac{-1+\alpha}{\alpha}} K_t^{\frac{\nu}{1-\nu}}. \tag{11}$$

Optimal policies at time t are functions of the state variable, K_t as in Grossman & Helpman (1998) and Krusell, Quadrini & Rios-Rull (1997).

The difficulty with such a set-up is that using the standard function forms, a closed form solution for optimal fiscal policies does not exist. In order to make the model as clear a 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. In addition, the primary results of the model will continue to hold if governments are permitted to issue debt.

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

These optimality conditions reveal the trade-offs faced by policy-makers. The first condition, (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.[13] Politicians' optimal level of transfers, given by (9), grow faster than the capital stock since $\nu > 0$. As politicians become less inclined to pursue redistributive policies, i.e., $\chi \to 0$, equation (9) shows that the politically optimal level of transfers approaches zero. Lastly, equation (10) reveals that, due to transfers, taxes grow faster than the capital stock.

Let us examine the implications of politically motivated policy-setting for the growth in government by defining g as government spending relative to output, $g(K_t) \equiv \frac{\tau_t^\star}{Y_t}$. For $\nu = \frac{1}{2}$, g increases exactly proportionally to output so that Wagner's law holds exactly. If politician's preferences for transfers are sufficiently strong ($\nu > \frac{1}{2}$), 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 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 $\{\tau_t^\star, \sigma_t^\star, \lambda_t^\star\}_{t=0}^\infty$ derived above. Note that since government programs have deadweight 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.

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

Theorem 1 *When politicians have preferences over capital deepening and transfers as in (1), the government policy triple* $\{\tau_t^\star, \sigma_t^\star, \lambda_t^\star\}_{t=0}^\infty$ *given by (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* $\{\lambda_t^\star\}_{t=0}^\infty$ *given by (8) when transfers are zero is constrained Pareto optimal.*

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

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

s.t.

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

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 (6). Solving this problem produces expression (8) for λ as claimed. ∎

Now we proceed to prove Theorem 1.

PROOF. Lemma 1 shows that government investment, $\lambda^\star$, from the constrained Pareto problem and the politician's problem are identical, but taxes are not, since transfers are non-zero. Define net income in the case where politicians choose policy to be

$\overline{Y}_1 \equiv K^\alpha[(1-\gamma_2)\lambda^\star]^{1-\alpha} + \sigma^\star(1-\gamma_1) - \tau^\star$. Similarly, let net income in the Pareto problem be $\overline{Y}_2 \equiv K^\alpha[(1-\gamma_2)\lambda^\star]^{1-\alpha} - \lambda^\star$. Using the expressions for $\lambda^\star$ and $\sigma^\star$ given in (8) and (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 & 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.[14]

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

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

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

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, (8), (9), and (10), the dynamical system for the economy, which we call the *political economy*, is given by

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

where $A \equiv \alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}(1-\gamma_2)^{\frac{1-\alpha}{\alpha}} > 0$ and $B \equiv (\nu\chi)^{\frac{1}{1-\nu}}\gamma_1^{\frac{-1}{1-\nu}} > 0$. To guarantee that the dynamics are nontrivial, we impose a condition on the depreciation rate, $\delta < s\alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}(1-\gamma_2)^{\frac{1-\alpha}{\alpha}}$. The first term in the brackets of equation (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.

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. 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*, has the dynamical system

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

where A is defined above. The Pareto optimal government policy transforms the standard Solow model into a linear model, known as the AK model.[15] 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 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.

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

Theorem 2 *Define* $K_T = ARGMAX_{K_t} K_{t+1}$*, where* K_{t+1} *is given by dynamical system (13) in which politicians choose government investment and transfers. If* $\nu > \frac{1}{sA+1-\delta}$*, 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 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 (1). Output growth is stimulated by reducing the weight placed on transfers, χ, thereby cutting transfers by (9) and taxes by (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 U.S. 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 (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 transfers and taxes yet again. Note that the absolute value of transfers generally grows between the cuts in χ because output growth increases tax revenues. 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. Figure 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.

[Figure 2 about here]

Figure 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 values of $\chi > 0$ for the political economy. The figure clearly shows the output loss that result from politically motivated policy-setting.

[Figure 3 about here]

[Figure 4 about here]

Politicians' ideologies determine the composition of government expenditures (Frey & Lau, 1968; Melisi-Ferretti & Spolaore, 1997). For example, Alt & Chrystal (1983) find that Labour governments in Great Britain provide more transfers than do Conservative governments. The next result shows that if politicians sufficiently value transfers, the equilibrium path of the economy cycles endogenously.

Theorem 3 *Under the restriction in Theorem 2, all dynamic equilibria of the political economy (13) are cyclic.*

PROOF. The equilibrium path is cyclic if the eigenvalue of the local approximation of the system about the steady state is negative. This eigenvalue, $\mathcal{E}$, which is always real, is given by $\mathcal{E} = \frac{1-\nu(sA+1-\delta)}{1-\nu}$. The restriction in the Theorem 2 guarantees that $\mathcal{E} < 0$. ∎

Corollary 1 *If politicians have sufficiently strong preferences for transfers, $\nu > \frac{1}{sA+1-\delta}$, then 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 reelected induces cycles in an economy that would otherwise have a monotone growth path (either converging to a steady state or on 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.[16] Note that Corollary 1 obtains even when politicians are not "leftist" in that they have convex preferences over transfers ($\nu > 1$), though

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

the corollary shows that "leftist" governments are more likely to destabilize their economies through high transfers.[17]

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 (13) admits a periodic cycle.*

PROOF. A two-cycle exists if $\frac{\partial K_{t+1}}{\partial K_t} |_{K_t=\overline{K}}= -1$. 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 $\overline{K}$. The restriction on ν in Theorem 2 guarantees that this is the case. Next, substituting the value for $\overline{K} = (\frac{sA-\delta}{sB})^{\frac{1-\nu}{\nu}}$ into the expression for $\frac{\partial K_{t+1}}{\partial K_t} = -1$, the critical value of ν that makes this expression hold is found, which we will call $\nu^\star$. Some algebra shows that $\nu^\star = \frac{2}{2-\delta+sA}$, 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 results in Section 3 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. Figure 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, Roubini & Cohen, 1997, Mueller, 1989, Willett, 1988), but

[17] The restriction in Corollary 1 obtains for $\nu \in (0,1)$ if $\delta < sA$. Under Theorem 2, $\nu \in (\frac{1}{1+A}, \infty)$, with $\frac{1}{1+A} < 1$.

runs counter to the traditional apolitical literature that examines the government's ability to reduce the amplitude of cycles.[18]

[Figure 5 about here]

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 socially. These findings are consistent with our intuition that political incentives produce suboptimal policies, but the dynamics of this suboptimality–the existence of thresholds and cycles–is indicative of the extent to which government policies determine aggregate economic dynamics. This is especially true since cyclic equilibria result in welfare losses (Suarez & Sussman, 1997; Susanto, 1995; Cooley & Hansen, 1992; Imrohoruglu, 1989).

The model predicts that when politicians choose fiscal policy, excessive transfers cause the welfare state to balloon. Eventually, the drag from taxes used to pay for transfers leads to spending reforms in which the welfare state is cut. Tanzi & 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" (p399). To wit, in 1870 subsidies and transfers for the countries in their study were, on average, one percent of GDP, which amounted 10% of total government outlays. By 1980, subsidies and transfers made up 50% government

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

spending in industrial nations, amounting to over 21% of GDP on average (Tanzi & Schuknecht, 1997, p399). We provide a political explanation for the changing composition and size of government expenditures. Tanzi & 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. Casual observation in the U.S. 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 entirely.

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