Political Parties and Optimum Government Financing: Empirical Evidence for Industrialized Economies*

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I. Introduction

Mankiw [12] argues that governments should equate the marginal losses of both taxation and seigniorage revenues to finance their spending. His model—the revenue smoothing hypothesis—implies that governments' tax and seigniorage revenues must move together. However, different types of political parties might be more concerned about creating seigniorage. The partisan theory argues that right-wing parties adopt less inflationary policies than left-wing parties. This theory assumes that there is a short term exploitable relationship between inflation and output growth, as the Phillips curve suggests. The theory also assumes that left-wing parties are more concerned with the unemployment rate than are right-wing parties. Therefore, to decrease the unemployment rate, left-wing administrations adopt more expansionary policies at the expense of higher levels of inflation [1; 3; 4; 7]. Furthermore, Burdekin [6] notes that countries which have a fixed exchange rate regime may face additional costs as they increase their seigniorage revenues. Increasing seigniorage revenue, which causes inflation, worsens the balance of payment deficit.

This paper analyzes the optimal government financing under different types of political and institutional considerations, and argues that when governments must create additional resources to finance their spending, they will then use both their seigniorage and tax revenues simultaneously. Moreover, it incorporates the idea that right-wing governments and countries which have a fixed exchange rate regime are more reluctant to create seigniorage revenue than left-wing governments or countries which have a flexible exchange rate regime to finance their spending.

The revenue smoothing hypothesis assumes that a government uses its monetary policy to create resources to finance its spending. However, such a government also uses its monetary policy to decrease the effects of business cycles and the variation of interest rates [9]. Barro and Gordon [5] show that a government may increase the levels of employment and of the GNP by increasing the money supply. Cukierman [8] argues that a government is concerned with the stability of financial markets. A government may increase its money supply to decrease the interest rates when they are too high, so that the financial system's likelihood of collapse will decrease. Later in this paper, the implication of the revenue smoothing hypothesis with the partisan and

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the fixed exchange rate effects will be tested after controlling for a government's other possible concerns.

The revenue smoothing hypothesis assumes that inflation is a proxy for a government's seigniorage revenues, e.g., Mankiw [12], Grilli [10], Poterba and Rotemberg [14] (P&R, hereafter) and Trehan and Walsh [15] (T&W, hereafter). These studies assume that governments have complete control over both tax and inflation rates. However, various factors beyond a government's control might affect the inflation rate. Therefore, I assume that governments' policy variable is the monetary base growth rates, not inflation. I believe that the monetary base growth rate is a better proxy than the inflation rate for the governments' seigniorage revenues. Later, I derive the inflation-tax rate relationship which P&R suggest (see Appendix A).

To discuss these issues, the paper is organized in the following way. In section II, I will establish the theoretical model needed to analyze the effect of governments' orientation within the revenue smoothing framework and then I will derive the testable implications of the model. Next, the paper discusses the data set. Later, I present the empirical evidence. The last section offers conclusions.

II. The Theoretical Model

Different parties represent different constituencies or different "pressure groups," and these groups are affected differently by taxation and money growth; hence the parties value taxation and money growth differently. This paper assumes that there are two parties (or groups), party D and party R. Their objective is to minimize their own expected present value of the deadweight loss from both taxation and money growth. Both tax and money growth rates are convex functions of the objective functions. Issuing bonds will only postpone the deadweight loss created by taxation and money growth. Since the functions are convex in these two variables, issuing bonds will create more inefficiencies in the future. Therefore, governments distribute the burden of financing their spending over time between tax and seigniorage revenues. The objective function for party D[1] is

$$W_t^D = E_t \sum_{s=0}^{\infty} (1+r)^{-s}[\theta_{t+s}^{1+\alpha} - \kappa^D (M_{t+s-1}/M_{t+s})^{1-\beta}]. \tag{1}$$

For party R, the objective function is

$$W_t^R = E_t \sum_{s=0}^{\infty} (1+r)^{-s}[\theta_{t+s}^{1+\alpha} - \kappa^R (M_{t+s-1}/M_{t+s})^{1-\beta}]. \tag{2}$$

Here, θ_t is the tax rate and M_t is the monetary base (money, hereafter) at time t. α, β, κ^D and κ^R are positive constants, and r is the fixed interest rate. The deadweight loss for the money growth rate is modeled as the negative of the inverse of the money growth rate, in order to have a tractable mathematical expression to derive the testable implication of the hypotheses. I assume that each party gives a different weight to the deadweight loss for the creation of money growth compared to taxation; party R is more sensitive to money growth than party D. Therefore, κ^R is greater than κ^D, as in the similar model of Alesina and Sachs [4].

1. The partisan theory assumes that the different parties are supported by the different constituencies, and these constituencies have fixed preferences for the level of money growth across time. Alesina and Sachs [4] also assume that once the party D (or R) is elected, it will minimize its objective function as if there will not be any election in the future.

The government's intertemporal budget constraint requires that the government debt be equal to the previous period's government debt, the interest payments of which, and government spending, minus government revenues. The government revenues are its tax and seigniorage revenues. The government's seigniorage revenue is the real change in the monetary base, which can be written as

$$(M_t - M_{t-1})/P_t = (1 - M_{t-1}/M_t)m_t. \tag{3}$$

Here, m_t is real money holdings, and P_t is price level. Therefore, the governments' intertemporal budget constraint can be written as

$$b_t = (1 + r)b_{t-1} + G_t - \theta_t y_t - (1 - M_{t-1}/M_t)m_t, \tag{4}$$

where b_t is government debt, G_t is real government spending, and y_t is real income at time t. The first order conditions require that the marginal cost of taxation equal the marginal cost of money growth. The marginal cost of taxation for both parties at time t is

$$[(1 + \alpha)\theta^{\alpha}]/[y_t(1 + \varepsilon_\theta)]. \tag{5}$$

Here, it is assumed that the elasticity of real income with respect to the tax rate, ε_θ, is fixed. The marginal cost of money growth for type D administration at time t is equal to

$$[(1 - \beta)\kappa^D(M_{t-1}/M_t)^{-\beta}]/[m_t(1 - \varepsilon_\mu)]. \tag{6}$$

Here, ε_μ is the constant elasticity of the real money holdings with respect to the money growth rate. The marginal cost of money growth for type R administration at time t is equal to

$$[(1 - \beta)\kappa^R(M_{t-1}/M_t)^{-\beta}]/[m_t(1 - \varepsilon_\mu)]. \tag{7}$$

If the logarithm of equations (5) and (6) are taken, then for party D, the first order conditions will yield the following

$$\begin{aligned}\ln(M_t/M_{t-1}) = {} & (1/\beta)\ln\{[(1 + \alpha)(1 - \varepsilon_\mu)]/[(1 - \beta)(1 + \varepsilon_\theta)]\} \\ & + (\alpha/\beta)\ln\theta_t + (1/\beta)\ln(m_t/y_t) - (1/\beta)\ln\kappa^D.\end{aligned} \tag{8}$$

For party R, the first order conditions will lead to

$$\begin{aligned}\ln(M_t/M_{t-1}) = {} & (1/\beta)\ln\{[(1 + \alpha)(1 - \varepsilon_\mu)]/[(1 - \beta)(1 + \varepsilon_\theta)]\} \\ & + (\alpha/\beta)\ln\theta_t + (1/\beta)\ln(m_t/y_t) - (1/\beta)\ln\kappa^R.\end{aligned} \tag{9}$$

Equations (8) and (9) can be combined with a dummy variable, D_t. At time t, D_t will have a zero value if the government is type R, and one otherwise. I will estimate the following equation to test the implications of the hypotheses.

$$\ln(M_t/M_{t-1}) = \gamma_0 + \gamma_1 \ln\theta_t + \gamma_2 \ln(m_t/y_t) + \gamma_3 D_t. \tag{10}$$

Where $\gamma_0 = (1/\beta)\ln\{[(1 + \alpha)(1 - \varepsilon_\mu)]/[(1 - \beta)(1 + \varepsilon_\theta)]\} - (1/\beta)\ln\kappa^R$, $\gamma_1 = (\alpha/\beta)$, $\gamma_2 =$

$(1/\beta)$ and $\gamma_3 = (1/\beta)(\ln \kappa^R - \ln \kappa^D)$, I expect the estimated coefficients for γ_1, γ_2 and γ_3 to be positive. In sum, the theory states that the money growth rate and the logarithm of the tax rate (tax rate, hereafter) are positively correlated. Furthermore, if the government is type D, then the government will use more seigniorage revenue to finance its spending.

III. Data

Observations from Australia, Austria, Belgium, Canada, Finland, France, Germany, Ireland, Japan, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States for the sample 1970–1989 are used to test the above hypotheses. Data for the consumer price index (CPI), the monetary base, government spending[2] and GNP[3] are taken from the International Monetary Fund-International Financial Statistics. Central government receipts are from OECD National Accounts Income and Outlay Transactions of General Government tapes. The tax rate is calculated as central government receipts over GNP. Money growth is measured by the first difference of the logarithm of the monetary base. Income is GNP, while inflation is the first difference of the logarithm of CPI. The data for the orientation of the government (D or R) is taken from Alesina [2] and is extended by Lane, McKay and Newton [11].

IV. Empirical Evidence

Burdekin [6] notes that because of balance of payment considerations, countries which have a fixed exchange rate regime cannot finance their spending with their seigniorage revenues as freely as countries that do not. Therefore, a dummy variable for the countries that are members of the European Monetary System (EMS, hereafter) is included. Furthermore, both the money growth rate (or inflation) and the tax rate may follow a time trend.[4] Therefore, the time trend also is included in the regression.[5] To perform the regression analysis, I used the Parks [13] method which performs the seemingly unrelated regression analysis across countries, but constrains the estimated coefficients across equations for each variable so that they are equal. Furthermore, the method considers the autocorrelation problem. Table I reports the estimates of the money growth-tax rate relationship (equation (10)) and the inflation-tax rate relationship that P&R suggest.[6] The sum of squared residuals (SSR) is also reported.[7] For both regressions the estimated coefficients for the tax rate and the money-income ratio are both positive and statistically significant[8] as the revenue smoothing hypothesis predicted. This supports the hypothesis that when governments need extra resources to finance their spending, they then raise both their seigniorage and tax revenues simultaneously. Furthermore, a positive coefficient for the partisan dummy, D_t, suggests that

2. Government spending for Japan is from the OECD tape, and for the U.S. from the Economic Report of the President, since these are not available from the International Monetary Fund-International Financial Statistics tape for the entire sample size.

3. The GNP figure is not available for France. Therefore, the GDP is used instead.

4. Trehan and Walsh [15] find that the tax rate and the inflation rate follow a time trend for the U.S.

5. Both Mankiw and P&R also include time trends in their models before they test.

6. The testable model for the inflation-tax rate relationship is derived in Appendix A.

7. SSRs are calculated after the Parks [13] transformation; therefore, they are approximately equal to the number of observations in the sample.

8. The level of significance is 5%, unless otherwise mentioned.

Table I. Revenue Smoothing Hypothesis: 1970–1989[a]

Dependent Variable	*Constant*	EMS_t	*Year*	$\ln\theta_t$	$\ln(m_t/y_t)$	$\ln(m_{t-1}/y_t)$	D_t	SSR
$\ln(M_t/M_{t-1})$	0.2272	−0.011	−0.002	0.0249	0.025		0.0127	291.88
	9.84	−1.99	−4.56	3.18	2.49		4.76	
$\ln(P_t/P_{t-1})$	0.1542	−0.007	−0.001	0.0304		0.01	0.0015	286.87
	9.37	−2.66	−1.95	6.23		3.51	1.33	

a. *t*-ratios are reported under the estimated coefficients.

Note: $\ln\theta_t$ = Logarithm of the tax rate; $\ln(m_t/y_t)$ = Logarithm of the real monetary base-real GNP ratio; $\ln(m_{t-1}/y_t)$ = Logarithm of the lag value of the real monetary base-real GNP ratio; EMS_t = Dummy variable for the countries which are members of EMS; D_t = Dummy variable for left-wing governments.

left-wing governments use more seigniorage revenue to finance their spending than do right-wing governments. However, this is not statistically significant for the inflation-tax rate relationship. Lastly, the estimated coefficient for the EMS dummy is negative and significant for both regressions; the countries which are members of EMS use less seigniorage revenue to finance their spending. Therefore, the implication of the revenue smoothing for a fixed exchange rate regime is supported for both relationships. However, the implication of the partisan effect is only supported for the money growth-tax rate relationship.

The existing relationships between tax and seigniorage revenues, as shown in Table I, ignore a government's other possible concerns. In other words, the estimates reported in the table might be proxying another underlying relationship rather than providing statistical evidence for the revenue smoothing hypothesis. To test the implication of the revenue smoothing hypothesis after controlling for a government's alternative concerns, I include in the regression analysis some additional variables that are suggested by alternative hypotheses. The first alternative hypothesis is that a government determines its monetary policy to smooth the interest rates. If this is correct, decreasing taxes causes a government's deficit to go up and increases interest rates at the given level of government spending. Therefore, once government spending is included in the regression analysis, the estimated coefficient for the tax rate should be negative. The second hypothesis is that governments use their monetary policies as an instrument to decrease the social burden caused by business cycles, rather than to increase their seigniorage revenues. If this is the case, then the estimated coefficient for the tax rate should not be different from zero when a proxy for the business cycle is included in the regression analysis. To perform the robustness tests, therefore, I include the logarithms of the government expenditure-GNP ratio, $\ln g_t$, and the deviation of real GNP from its trend-trend real GNP ratio, ν_t, in the regression. Table II reports the results for the period 1972–1989.[9]

The results from Table I are robust except the EMS effect on the inflation-tax rate relationship. Both coefficients for tax rates and partisan dummies are positive and statistically significant for the two relationships. However, the coefficient of the EMS dummy is negative and significant only for the money growth-tax rate relationship.

The estimated coefficients for the deviation of output from trend are positive when the seigniorage revenue is proxied by the inflation rate and negative when the seigniorage revenue is proxied by the money growth rate; however, they are statistically insignificant. Furthermore, the

9. The sample size starts from 1972 rather than 1970, because government spending figures are not available for all countries for 1970–1971.

Table II. Revenue Smoothing Hypothesis-Robustness Tests: 1972–1989[a]

Dependent Variable	*Constant*	EMS_t	*Year*	$\ln\theta_t$	$\ln(m_t/y_t)$	$\ln(m_{t-1}/y_t)$	D_t	$\ln g_t$	v_t	SSR
$\ln(M_t/M_{t-1})$	0.2141	−0.011	−0.002	0.0347	0.0068		0.0068	0.0008	0.046	260.71
	7.73	−1.98	−4.76	3.53	0.67		2.24	0.10	1.79	
$\ln(P_t/P_{t-1})$	0.1646	0.0011	−0.002	0.0392		−0.000	0.0061	−0.014	−0.01	257.68
	14.33	0.42	−6.00	8.56		−0.10	12.70	−4.42	−1.14	

a. *t*-ratios are reported under the estimated coefficients.
Note: $\ln g_t$ = Logarithm of government spending-GNP ratio; v_t = Deviation of the real GNP from its trend divided by the trend real GNP.

Table III. Revenue Smoothing Hypothesis with the IVT: 1972–1989.[a,b]

Dependent Variable	*Constant*	EMS_t	*Year*	$\ln\theta_t$	$\ln(m_t/y_t)$	$\ln(m_{t-1}/y_t)$	D_t	SSR
$\ln(M_t/M_{t-1})$	0.154	−0.02	−0.003	0.0257	−0.022		0.0028	1.8235
	2.35	−1.42	−2.85	1.66	−1.02		0.26	
$\ln(P_t/P_{t-1})$	0.2094	−0.007	−0.004	0.0291		−0.004	0.0066	0.4307
	8.31	−1.26	−8.81	4.70		−0.52	1.49	

a. *t*-ratios are reported under the estimated coefficients.
b. The instruments are the lag value of the logarithm of the tax rate, the lag value of the deviation of the real GNP from its trend divided by the trend real GNP, a dummy variable for countries which are members of the European Monetary System, the logarithm of the lagged government spending-GNP ratio, the time trend, and their additive and interactive dummies with the partisan effect.

negative and statistically significant coefficient for the government expenditure variable rejects the implication of the interest rate smoothing hypothesis for governments.

The theory in section II suggests that governments set their tax and seigniorage revenues simultaneously. The first order conditions not only imply that the marginal cost of taxation equals the marginal cost of money growth, but also require that the marginal cost of taxation (or money growth) must be the same across time, as T&W argue. Hence, the theory assumes that both the money growth and tax rates affect the logarithm of the money-income ratio; the tax rate, the money growth rate and the money-income ratio are endogenous variables. Therefore, performing a single regression technique on equation (10) might give biased estimates; the tax rate and money-income ratio on the right hand side of the regression may be correlated with the error terms. Therefore, the instrumental variable technique (IVT, hereafter) is also used to estimate the equations. The instruments are the lagged value of the logarithm of tax rate, the lagged value of the deviation of the real GNP from its trend divided by the trend real GNP, a dummy variable for countries which are members of the European Monetary System, the logarithm of the lagged government spending-GNP ratio, the time trend, and their additive and interactive dummies with the partisan effect. To perform the IVT, the ordinary least square method is used for both the first and second stage regressions.

Table III reports the results when the IVT is applied. The estimated coefficients for the tax rate, the partisan dummy and the EMS dummy have the expected signs; however, only the tax rate for the inflation-tax rate relationship is statistically significant.

The IVT is also used for the robustness tests (Table IV). For both relationships, the tax rate, the partisan and the EMS dummies have the expected signs; however, only the tax rates are statistically significant.

Table IV. Revenue Smoothing Hypothesis-Robustness Tests with the IVT: 1972–1989[a,b]

Dependent Variable	*Constant*	EMS_t	*Year*	$\ln\theta_t$	$\ln(m_t/y_t)$	$\ln(m_{t-1}/y_t)$	D_t	$\ln g_t$	v_t	SSR
$\ln(M_t/M_{t-1})$	0.1268	−0.01	−0.003	0.0473	−0.035		0.001	−0.026	0.0303	1.8235
	1.815	−0.6	−2.963	2.051	−1.441		0.09	−1.252	0.56	
$\ln(P_t/P_{t-1})$	0.1963	−0.000	−0.004	0.0435		−0.011	0.0058	−0.017	0.0117	0.4307
	7.403	−0.053	−9.038	4.737		−1.187	1.281	−2.098	0.546	

a. *t*-ratios are reported under the estimated coefficients.

b. The instruments are the lag value of the logarithm of tax rate, the lag value of the deviation of the real GNP from its trend divided by the trend real GNP, a dummy variable for countries which are members of the European Monetary System, the logarithm of the lagged government spending-GNP ratio, the time trend, and their additive and interactive dummies with the partisan effect.

The empirical evidence that has been discussed in this section shows that the implication of the revenue smoothing hypothesis is generally supported. Secondly, I find that the partisan effect is also a determinant of the government's seigniorage revenue creation; however, such an effect is not statistically significant when the IVT is used. Lastly, this paper demonstrates that data does not support the fixed exchange rate effect.

Even if the seemingly unrelated regression results support the implication of both the hypotheses, the result for the partisan effect is not robust when the IVT is used. The reason might be that the results from Table I are biased. However, when the IVT is performed, the sample size was reduced. Another reason might be that the Parks method gives more efficient estimates than the ordinary least square method. On the other hand, I could not use the Parks method, because the correction for autocorrelation is not needed.

V. Conclusion

The existing literature on the revenue smoothing hypothesis assumes that the inflation rate is a proxy for governments' seigniorage revenue; therefore, the theory derives a relationship between the inflation and the tax rate. The inflation rate might be affected by various factors other than governments' seigniorage revenue. I derived the implication of the revenue smoothing hypothesis when the governments have control over the money growth rates rather than over inflation. Furthermore, this paper incorporates the possibility that left-wing parties assign relatively less weight to money growth, as the partisan theory suggested.

This paper argues that when governments need extra resources to finance their spending, then they increase both their seigniorage and tax revenues. Moreover, left-wing administrations use more seigniorage revenue to finance their spending than right-wing administrations. These hypotheses are tested empirically and supported. However, when the instrumental variable technique is used, supporting evidence that left-wing governments create more seigniorage revenue decreases.

Appendix A. Derivation of the Inflation-Tax Rate Relationship

Here, I derive the implication of inflation-tax rate Relationship, as P&R suggest. The objective function of party *D* is

$$W_t^D = E_t \sum_{s=0}^{\infty} (1+r)^{-s}[\theta_{t+s}^{1+\alpha} - \kappa^D (P_{t+s-1}/P_{t+s})^{1-\beta}]. \tag{11}$$

The objective function of party R is

$$W_t^R = E_t \sum_{s=0}^{\infty} (1+r)^{-s}[\theta_{t+s}^{1+\alpha} - \kappa^R (P_{t+s-1}/P_{t+s}^{1-\beta}]. \tag{12}$$

The government's seigniorage revenue can be written as

$$(M_t - M_{t-1})/P_t = m_t - (P_{t-1}/P_t)m_{t-1}. \tag{13}$$

Therefore, the government's intertemporal budget constraint is

$$b_t = (1+r)b_{t-1} + g_t - \theta_t y_t - [m_t - (P_{t-1}/P_t)m_{t-1}]. \tag{14}$$

For party D, the first order conditions lead to

$$\ln(P_t/P_{t-1}) = (1/\beta)\ln\{[(1+\alpha)(1+\eta)]/[1-\beta)(1+\varepsilon_\theta)\} + (\alpha/\beta)\ln\theta_t + (1/\beta)\ln(m_{t-1}/y_t) - (1/\beta)\ln\kappa^D. \tag{15}$$

For party R, the first order conditions lead to

$$\ln(P_t/P_{t-1}) = (1/\beta)\ln\{[(1+\alpha)(1+\eta)]/[1-\beta)(1+\varepsilon_\theta)]\} + (\alpha/\beta)\ln\theta_t + (1/\beta)\ln(m_{t-1}/y_t) - (1/\beta)\ln\kappa^R. \tag{16}$$

Here, ε_θ is the constant elasticity of real income with respect to the tax rate, and η is the constant elasticity of the real money holdings with respect to inflation. One can combine these two equations with a dummy variable D_t. At time t, D_t will have a value of zero, if the government is type R, and otherwise a value of one. The testable equation is

$$\ln(P_t/P_{t-1}) = \gamma_0' + \gamma_1' \ln\theta_t + \gamma_2' \ln(m_{t-1}/y_t) + \gamma_3' D_t. \tag{17}$$

Here, $\gamma_0' = (1/\beta)\ln\{[(1+\alpha)(1+\eta)]/[(1-\beta)(1+\varepsilon_\theta)]\} - (1/\beta)\ln\kappa^R$, $\gamma_1' = (\alpha/\beta)$, $\gamma_2' = (1/\beta)$ and $\gamma_3' = (1/\beta)(\ln\kappa^r - \ln\kappa^d)$. I expect all the estimated coefficients for γ_1', γ_2' and γ_3' to be positive.

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