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Public Sector Price Controls and Electoral Cycles

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ABSTRACT

Public enterprise prices are important policy instruments in developing economies. This is why public sector price polices constitute a key element of stabilization programs implemented in these economies. However, this significance is not specific to stabilization episodes. Firstly, this paper questions whether an opportunistic politician can manipulate public prices to win elections. We analyze the impact of such price controls on budget deficits and the repercussions of alternative financing mechanisms of these deficits on the inflation rate and voters' behavior. It is shown that electoral inflation cycles are obtained under domestic debt financing, whereas money financing does not permit such a manipulative policy. Secondly, by focusing on data of the Turkish economy for the 1987(1) – 2003(12) period, empirical evidence for such manipulative policies is given.

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I. INTRODUCTION

Public enterprise prices are important policy instruments in developing economies. Public sector price controls increase deficits of state-owned enterprises, which account for a sizeable portion of total public sector deficits in these economies. Hence, price reform plays a central role in stabilization episodes in developing economies. Edwards (1989), for example, showed that public enterprise price increases were involved in 79 percent of IMF programs between 1983 and 1985.[1] Buffie (1992) and Buffie (1998) advocated that credible stabilization reforms should incorporate increases in public sector prices. These views notwithstanding, price controls are common in developing and transition economies, especially during heterodox stabilization episodes. Dornbusch *et al.* (1990) and Kiguel and Liviatan (1992) provided reviews of stabilization programs based on price and wage controls. In the 1980s, Argentina, Brazil, Israel, and Mexico implemented such programs.

However, price controls are not only specific to stabilization episodes. The fact that voters dislike an increase in inflation can be an incentive for opportunistic policymakers to control prices. Despite this fact, there has been relatively little empirical evidence regarding the relationship of price controls and electoral cycles. Jonung (1990) drew a connection between the role of price controls and political support for the incumbent in the context of Sweden. Agenor and Taylor (1992) argued that price controls in Brazil in the 1980s were related to the presidential and congressional electoral cycles. Literature has mainly focused on

manipulative monetary and fiscal polices. For example, in an extensive study, Alesina *et al.* (1997) documented empirical evidence on traditional and rational political business cycle and partisan effects in monetary and fiscal policies. As far as we are aware, the first study, in which the interactions between electoral considerations and the imposition of price controls by opportunistic policymakers are theoretically investigated was conducted by Agenor and Asilis (1997). Following the opportunistic political business cycle theory pioneered by Nordhaus (1975), they presented a model that leads to the tightening of price controls in periods just before an election, and relaxes immediately afterwards. In their paper they did not differentiate between public and private sector prices; and furthermore, the effects of alternative financing mechanisms of widened budget deficits due to such controls on electoral cycles were not analyzed.

Can an incumbent control public prices before elections to increase his/her chances of re-election? Will the resulting impact of such controls on budget deficits and the way these deficits are financed have any consequence on the behavior of the incumbent? The first aim of this paper is to address these questions. A model along the lines of Nordhaus (1975) to extend Agenor and Asilis (1997) is provided. It is shown that under domestic debt financing, even though public price controls increase budget deficit, an incumbent can decrease the rate of increase of public prices in periods preceding elections. This result does not apply under money financing. Our results indicate that stabilization policies in developing and transition economies that only pay attention to preventing government

access to central bank resources to finance budget deficits are not sufficient to prevent the occurrence of manipulative policies. Increasing transparency of budget processes, putting limits on debt financing and privatization policies are important factors as well.

The second objective of this study is to provide empirical evidence of the impact of elections on price controls by focusing on Turkish data for the period 1987(1) – 2003(12). It is shown that the public inflation rate was kept significantly below the private inflation rate in the periods preceding elections. The paper is organized as follows. The next section provides a model that extends Agenor and Asilis (1997). In the third section the empirical evidence is given and the final section concludes.

II. THE MODEL

In this section, a model along the lines of Nordhaus (1975) is built, that characterizes manipulative electoral public pricing policies and also takes into consideration the impact of price controls on budget deficits. Two different forms of deficit finance are considered: bond financing and money financing.

We consider a closed economy with two goods and four types of agents: private firms, public firms, households, and the government. It is assumed that both type of firms use the same technology. Real output is assumed to be constant. Households consume both of the goods. The general price level, measured in natural logarithms, (p_t) can be defined as

$$p_t = \delta_1 p_{g,t} + \delta_2 p_{p,t}, \tag{1}$$

where δ_1 and δ_2 are the shares of public ($p_{g,t}$) and private prices ($p_{p,t}$) in the general price level, respectively, and $\delta_1+\delta_2=1$.

There are only two financial assets in the economy: an interest bearing government bond (B) and a non-interest bearing base money (M). In the absence of any price control, the rate of inflation (π) is simply determined by the rate of growth of money supply. The rate of increase of private sector prices ($\pi_{p,t}$) is always set at the money growth rate.[2] However, public price controls cause the actual inflation rate to deviate from this equilibrium rate. That is

$$\pi_{p,t} = \frac{\dot{M}_t}{M_t} = \mu_t, \tag{2}$$

$$\pi_t = \delta_1 \pi_{g,t} + \delta_2 \pi_{p,t} = \delta_1 \pi_{g,t} + \delta_2 \mu_t, \tag{3}$$

where μ is the rate of growth of the nominal money supply, $\pi_{g,t}$ is public inflation, and a dot over a variable denotes its derivative with respect to time.

The government budget constraint in real terms is

$$\dot{m}_t + \dot{b}_t = r_t b_t - (x_t - g_t) + k\left(\pi^*_{g,t} - \pi_{g,t}\right) - \pi_t m_t, \tag{4}$$

where m is the real money stock, b is the real domestic debt stock, r is the real interest rate, x is real tax income of the government, g is real government expenditures, and π is the inflation rate. For simplicity, the real interest rate is taken as constant[3] and real government expenditures as zero. The third term on the right hand side shows to what extent public sector price controls widen budget deficit. $\pi_{g,t}^*$ is the shadow public sector inflation level. In other words, $\pi_{g,t}^*$ is the level which public sector inflation would take under current economic conditions and in the absence of price controls. Note that when $\pi_{g,t} = \pi_{g,t}^*$, there is no effect of public price controls on budget deficit. Note furthermore that should there be no public price controls, $\pi_{g,t} = \pi_{g,t}^* = \pi_{p,t} = \mu_t$. The constant k measures the effect of public sector price controls on the budget deficit as a ratio to the GDP.

As in the original model of Nordhaus (1975), we assume that politicians are 'opportunistic'; they are only concerned about holding office. The timing of elections is exogenously fixed and they are held at every T periods. Voters are retrospective.[4] The rate of decay of their memory is $\rho>0$. They are more influenced by recent outcomes than the distant past. Voters dislike inflation, an increase in real value of taxes (x) and an unsustainable path for real debt stock. The first two factors do not require further comment. The rationale behind the third argument of the vote function is as follows: since an unsustainable path for debt stock is an invitation either for distortionary taxes or inflationary money financing in the future, it is welfare decreasing. We define the sustainable level of real debt stock as a constant level (b^*) at which the debt stock is stabilized. The

smaller the debt relative to b^*, the better for the voters. Reducing public inflation to increase chance of re-election before elections worsens fiscal deficit. To cope with this increase in deficit, taxes can be increased. However, this causes a decrease in the number of votes for an incumbent. Alternatively, either issuing debt or increasing the money supply can finance budget deficits. Bond financing, by increasing real interest payments upwards, widens the fiscal deficit, and pushes debt stock to an upward path, which is not welcomed by the voters. Money financing, on the other hand, causes private inflation to rise. Hence, there is a trade-off for the incumbent. The vote function is

$$V_t = -\int_0^T \left(\frac{1}{2}\theta\pi_t^2 + \frac{1}{2}\alpha x_t^2 + (b_t - b_t^*) \right) e^{\rho t} dt \,, \qquad (5)$$

where the parameters θ and α respectively capture the relative importance given to inflation and taxation by voters.[5]

Bond financing

In this alternative, money supply growth rate is zero, that is, $\mu=\pi_{p,t}=0$. Controlling public prices will increase the public deficit, and consequently, the resulting deficit has to be financed either by issuing debt or increasing taxes. In this case, an incumbent has two control variables: public inflation and real taxes. The state variable of the optimal control problem is real bond stock. The dynamic optimization problem now reduces to maximizing Equation 5 subject to

$$\dot{b}_t = rb_t - x_t - k\pi_{g,t}, \tag{6}$$

and

$$b^* = \frac{(x_t + k\pi_{g,t})}{r}, \tag{7}$$

where the latter constraint gives the level of debt that holds debt stock constant and obtained from Equation 6 by equating the time derivative of real debt stock to zero.

The current value Hamiltonian (*H*) is given by

$$\begin{aligned} H_t = & -0.5\theta(\delta_1\pi_{g,t})^2 - 0.5\alpha x_t^2 + \frac{k}{r}\pi_{g,t} \\ & + \frac{x_t}{r} - b_t + \lambda_{1,t}(rb_t - x_t - k\pi_{g,t}). \end{aligned} \tag{8}$$

The necessary and sufficient conditions for a maximum are

$$\frac{\partial H_t}{\partial \pi_{g,t}} = 0, \tag{9}$$

$$\frac{\partial H_t}{\partial x_t} = 0, \tag{10}$$

$$\dot{\lambda}_{1,t} = -\partial H_t / \partial b_t - \rho\lambda_{1,t}, \tag{11}$$

$$\lambda_1(T) = 0, \tag{12}$$

where $\lambda_{1,t}$ is the co-state variable associated with the state variable -real domestic debt stock. The transversality condition given in Equation 12 indicates that at election time there is no further electoral gain from reducing real domestic debt stock.

The solution of this problem yields[6]

$$\pi_{g,t} = \frac{k}{\theta\delta_1^2 r(\rho + r)}\left[\rho + re^{(\rho+r)(T-t)}\right]. \qquad (13)$$

That is as the election time (T) approaches public inflation is lowered by an opportunistic incumbent. If the importance given to inflation is not too high (a lower θ), then public inflation is kept at a relatively high level, but it still follows a downward path as the election time approaches. Immediately after the elections, noting that $t=0$, public inflation attains its highest value. Although it is not shown here, a similar path is followed by the real value of taxes. Hence, this model shows that despite the fact that public price controls widen fiscal deficit, under bond financing, the rate of growth of public price can be manipulated by an opportunistic incumbent: Immediately after an election, public inflation can be raised and then continuously reduced as an election approaches.

Money financing

In this case, in order to analyze only the effects of money financing and to abstract from any inference coming from debt stock, we assume that

there is no inherited debt. Dividing the nominal budget deficit identity by the price level and rearranging yields

$$\frac{\dot{M}_t M_t}{M_t P_t} = k(\pi_{p,t} - \pi_{g,t}) - x_t , \tag{14}$$

which, using Equation 2 and the definition of real money stock *($m_t=M_t/P_t$)*, further gives real tax income as

$$x_t = (k - m_t)\mu_t - k\pi_{g,t} . \tag{15}$$

We need a state equation for the evolution of real money stock. Taking the time derivative of both sides of the definition of real money stock and rearranging using Eqs. (2) and (3) yields

$$\dot{m}_t = \delta_1 m_t(\mu_t - \pi_{g,t}) . \tag{16}$$

Now, the optimization problem has two control variables, the money supply growth rate and public inflation, and one state variable – real money supply. The incumbent has to maximize Equation 5 subject to Equations 15 and 16. Plugging the real value of taxes from Equation 15 into Equation 5 and noting that $b=b^*=0$, the current value Hamiltonian of the optimal control problem becomes

$$\begin{aligned} H_t = & -0.5\theta\left[\delta_1\pi_{g,t} + \delta_2\mu_t\right]^2 - 0.5\alpha\left[(k - m_t)\mu_t - k\pi_{g,t}\right]^2 \\ & + \delta_1 m_t \lambda_{2,t}(\mu_t - \pi_{g,t}). \end{aligned} \tag{17}$$

where $\lambda_{2,t}$ is the co-state variable associated with the state variable -real money stock. The necessary and sufficient conditions for a maximum are

$$\frac{\partial H_t}{\partial \pi_{g,t}} = 0\,, \tag{18}$$

$$\frac{\partial H_t}{\partial \mu_t} = 0\,, \tag{19}$$

$$\dot{\lambda}_{2,t} = -\partial H_t / \partial m_t - \rho \lambda_{2,t}\,, \tag{20}$$

$$\lambda_2(T) = 0, \tag{21}$$

The transversality condition given in Equation 21 indicates that at election time there is no further electoral gain from changing real money stock.

After some algebraic manipulations, this optimization problem yields two non-linear differential equations for the real money stock and the co-state variable and two equations for public inflation and the rate of growth of money supply.[7] Making use of the transversality condition simplifies the solution of the problem. From the equations provided in Appendix A and the transversality condition given in Equation 21 one obtains

$$\lambda_2(T) = \pi_g(T) = \mu(T) = \dot{\lambda}_2(T) = 0\ . \tag{22}$$

Note that since the time derivative of λ_2 at time T is zero, $\lambda_2(T) - \lambda_2(T-dt) = 0$, where dt denotes an infinitely small change in time. Since $\lambda_2(T) = 0$, one obtains $\lambda_2(T-dt) = 0$. Using this, as a new transversality condition will again yield Equation 22, but this time for $t = T-dt$. Iterating backwards in this way will give

$$\lambda_{2,t} = \pi_{g,t} = \mu_t = 0 \ . \tag{23}$$

Hence, optimization leads to a constant path for public prices and money supply. That is, public inflation and the money supply growth rate is kept at a zero level. These findings indicate that under money financing, it is not optimal for an incumbent to control public prices. This means that under these conditions there is no room for maneuver for an opportunistic incumbent.

Economic policy implications

What do these results tell us? Money financing of budget deficits that arise as a result of public price controls increases inflation in the private sector. Hence, inflationary pressures in the private sector offset the inflationary gain obtained from controlling public prices. This is why it is not optimal for an incumbent to manipulate public prices throughout the electoral term to increase the number of votes; it is useless. However, in the case of bond financing, such inflationary pressures on the private sector do not exist. Hence, controlling public prices before the elections

help to reduce inflation and thus gives an incumbent some room for maneuver.

Note that a similar discrepancy between the effects of bond and money financing of public sector deficits is also observed in the first generation currency crises models. Money financing of public sector deficits in these models causes foreign exchange reserves of the central bank to deteriorate, which makes the collapse of the fixed exchange rate regime inevitable. In sharp contrast, there will be no reserve losses when bond issues finance public sector deficits. Calvo (1998) named this situation as the "masking of balance of payments crises".[8] However, this does not mean that, under bond financing, public price controls in our model or irresponsible macroeconomic policies of governments in the first generation models can be continued forever. On the contrary, this will push real debt stock to follow an unsustainable path, which is sooner or later punished by voters in our model or by speculators in Calvo (1998).

This analysis also shows that structural reforms that only pay attention to stopping governments' access to central banks' resources to finance budget deficits – i.e., making central banks independent, are not sufficient to prevent the occurrence of manipulative policies. Increasing the transparency of budget processes, putting limits on debt financing and privatization policies are important factors as well.

III. EMPIRICAL RESULTS

Empirical literature generally presents convincing evidence of the existence of pre-electoral manipulation of economic policy, especially fiscal policy, in industrialized democracies.[9] In this section, we provide evidence for manipulative public sector pricing policies around elections from an emerging economy. In what follows, we first execute the procedure followed in Alesina *et al.* (1997, chapters 4, 6, and 7). We then divert from this procedure to present further evidence and check the robustness of the results obtained in the first phase.

Test of the political business cycle model on public sector inflation

We consider monthly observations of the difference between public and private inflation.[10] Empirical studies in political business cycle literature generally test the various theories by running regressions including political variables among the regressors. Following, for example Alesina *et al.* (1997, chapters, 4, 6, and 7) and Drazen (2000, pp. 240) we estimate the following model:

$$\pi_{d,t} = \phi_0 + \sum_{i=1}^{n} \phi_i \pi_{d,t-i} + \phi_{n+1} DPREN_t + \varepsilon_t, \qquad (24)$$

where $\pi_{d,\,t}$ is the difference between the public and private monthly inflation rates ($\pi_{d,\,t}=\pi_{g,\,t}-\pi_{p,\,t}$) and *DPREN* is a political dummy variable. *DPREN* takes a value of 1 in the *N* months preceding an election and in the election month, otherwise it is 0. It aims to capture the electoral

manipulations in the periods preceding elections. We do not take a structural stance on the determinants of the public and private inflation; that is why in Equation 24 there is an autoregressive specification for the dependent variable. Note that this is the usual practice in literature and as emphasized in Alesina *et al.* (1997, pp. 83) and Drazen (2000, pp. 240), such a strategy allows for testing whether one finds a significant effect of the political dummies on the dependent variable after having controlled for the (auto-regressive) history of the dependent variable.

The next issue is to specify a value for *N*. In their work on political cycles in industrial countries, one of the conclusions reached by Alesina *et al.* (1997, pp.3) is "… opportunistic effects are confined to short-run, occasional manipulations of policy instruments around elections; for instance, in election years, one may expect loose monetary and fiscal policies." They report their results for *N=3* quarters. Note that a relatively short pre-electoral manipulative policy is consistent with Nordhaus's (1975) political business cycle model. Following Alesina *et al.*, we choose *N=12* and alternatively *N=6* months. Note further that, based on our results presented in the preceding section, the coefficient of *DPREN* should be negative.

The 1987(1) – 2003(12) period is analyzed. There are two reasons for choosing 1987(1) as the starting period. First, data for public and private inflation is available starting from 1984(1). Second, after the military coup of September 1980, the first general election took place in 1983. However, there were restrictions regarding the competing political

parties, which were lifted in 1987 by a referendum held in the same year. There are seven elections in this period: five of them are general elections and the remaining two are municipality elections. The reason for including municipal elections in the analysis is the fact that in Turkish political life they have been considered as a vote of confidence for the incumbent and generally triggered heated debates on early elections. Table 1 provides information regarding election times and types.

[Insert Table 1 here]

Estimation results of Equation 24 are presented in Table 2. Seasonal dummies have also been included. The first six columns of Table 2 report coefficients of the variables, relevant t-statistics in parentheses under each coefficient, and some diagnostic tests for six alternative models. Coefficients of the autoregressive part and seasonal dummies are not shown. In the first model we estimated Equation 24 by choosing $N=12$, whereas in the second model $N=6$. Then, these two models were re-estimated including the monthly rate of changes of real oil prices. The main rationale behind the inclusion of oil prices is to check the robustness of our results for any possible effect stemming from exogenous oil price changes. For the first four models we used all 12 lags of the dependent variable as the autoregressive part (n=12). Then, we re-estimated the third and fourth regressions by choosing the lag length based on the Schwarz criterion. Consequently, the lag length turned out to be 9 for the fifth and sixth models.

[Insert Table 2 here]

In all cases the coefficients of the political dummy were correctly signed and highly significant. It can also be noted that controlling the effects of oil prices did not change the significance level of the dummy variable. The residuals do not suffer from autocorrelation. The "regression specification error test (Reset)" results do not indicate specification problems in most cases. The final diagnostic test is for possible omitted variables. Note that, as mentioned above, following Alesina *et al.* (1997, pp. 83) and Drazen (2000, pp. 240) we did not take a structural stance on the determinants of public and private inflation and used an autoregressive specification instead. In highly "dollarized" emerging economies the rate of change of the exchange rate is one of the determinants of the inflation rate. This so called "pass-through" effect arises due to the impact of exchange rate changes on expectations and the marginal cost of manufacturing firms which use imported intermediate inputs. We checked whether the real exchange rate was an omitted variable in Equation 24.[11] The likelihood ratio test results given in Table 2 do not point to a problem in excluding this variable from our specification. Based on these results we can conclude that there is significant evidence for electoral manipulations of public sector prices around election times. Taking a maximum of a 12-month window before each election, it can be clearly seen that relative to the evolution of private inflation, successive incumbents significantly lowered public sector inflation rates before elections.

Large differences between the public and private inflation rates

We now turn to the large differences between the public and private inflation rates and to probable underlying reasons. Large differences are defined as those observations greater (smaller) than the mean plus (minus) one standard deviation of the difference of the public and private inflation rates. Table 3 shows these considerable differences. In the 1987(1) – 2003(12) period, the mean of the difference between the public and private inflation rates was 0.19%, while the standard deviation was 3.0%. The maximum and minimum values were 22% and –7%, respectively. There are a total of 30 large differences. The difference between the two inflation rates exceeded 3.19% in 19 cases and was below 2.81% in 11 cases. If there are sharp upward or downwards movements in inflation rates, a comparison using historical mean only, could lead to inaccurate conclusions. Hence, to minimize this risk, in the second and third columns further information is provided on the relative magnitude of the public sector inflation rate at times when these large differences occurred. In the second column, the ratio of monthly public sector inflation rate is shown in period t to its annual value in period *t-1*. The third column gives the ratio of the monthly public sector inflation rate at *t* to its twelve-month moving average at *t-1*. Based on the evidence documented so far, it can be concluded that there were occasional sharp movements in public inflation rate in the period analyzed and moreover, such outliers occurred when there were no parallel movements in the private inflation rate.

[Insert Table 3 here]

Table 4 provides information on the relationship between the observations given in Table 3 and elections. A twelve-month symmetric window around the election times was used. The first column reports number of months lagging (+) or leading (-) an election. Fourteen of the nineteen substantial positive differences between the public and private inflation rates were related to election times. However, two of the fourteen cases took place before an election and thus were at odds with the theory. Twelve of the fourteen cases occurred after an election as envisaged in our political public sector price control cycle model. Moreover, in the twelve-month period following each one of the seven elections, there were public sector price increases. Narrowing the symmetric window to six months does not change the picture: this time eleven of the nineteen cases were related to election times. Nine of the eleven large negative differences between the public and private inflation rates occurred around election times. Six of these nine large negative differences took place before an election.[12] Only three of the seven elections were responsible for large negative differences.

[Insert Table 4 here]

The evidence documented in Table 4 reinforces results which were obtained from various alternative estimations of Equation 24. In the period analyzed, there were opportunistic public sector price controls. Controlling both for the history of the dependent variable and oil price changes, using a twelve-month window before elections, we have shown that the public sector inflation rate was kept artificially low before an election relative to

private sector inflation. Moreover, a significant percentage of the large differences between public and private inflation rates occurred around election times.

The role of IMF based stabilization programs

In the introduction, the importance of price reform in stabilization episodes in developing economies was stressed, however, the evidence on the direction of change of controlled prices was mixed. As discussed above, there were programs in which price increases were at the center of the stage. However, there were also programs based on price controls. The Turkish evidence will now be examined.

In the period analyzed there were three IMF based stabilization programs: July 1994 – March 1996, December 1999 – February 2001, May 2001 – February 2005.[13] In Table 4, in the IMF column, the relationship between the starting date of these programs and the vast differences between public and private inflation is shown. Each entry shows how many months before (-) or after (+) the start of a program a significant positive difference occurred. Evidently, at the beginning of two of the three IMF programs and a few months after the third one, there were public sector price hikes.

We re-estimated Equation 24 –models 5 and 6- including IMF stabilization program dummy variable as well. This dummy takes a value of 1 for those observations marked in Table 4 under the 'IMF' column. Results are shown in Table 5, columns 1 and 2. As expected from the evidence

documented in Table 4, the coefficient of this dummy is positive and highly significant. More importantly, once the stabilization program effect was controlled for, the political dummy remained significant and correctly signed.

[Insert Table 5 here]

Extensions

Further robustness checks were carried out. First, we ran the model without the municipal elections. In columns 3 and 4 of Table 5 the results of the case where there are nine lags of the dependent variable, the change of real oil prices, and the dummy variable for the IMF based stabilization programs are reported. The election dummy is still significant and correctly signed. We did not report the results for the other variants of Equation 24 (like the ones reported in Table 2), but in all cases the election dummy was significant.

Grier (1989) and Williams (1990) criticized the discontinuous nature of the election dummy used in literature and above, which drops from 1 to 0 after N+1 months. Williams suggested using a counter dummy, taking a value of 1 in the month following the election and thereafter rising up in a linear way to the following election. We used this counter dummy for the second robustness check. The result is reported in the fifth column of Table 5. Again, the election dummy is significant and correctly signed.

Up to now, the sign and significance level of the pre-election dummy are used as the evidence for manipulative public sector price controls, as in political business cycle literature. It could also be that part of the differences between the public and private inflation rates attributed to manipulation is due to factors not under consideration in the present study. In order to properly attribute the role "manipulation" plays, Equation 24 is estimated for the public and private sector inflation rates separately and the Blinder (1973) decomposition method is used.[14] More formally, the following regression was estimated, where the index j is for the type of the sector (private: *p* or government: *g*):

$$\pi_{j,t} = \phi_{j,0} + \sum_{i=1}^{n} \phi_{j,i} \pi_{j,t-i} + \phi_{j,n+1} DPREN_t + \phi_{j,n+2} DIMF_t + \phi_{j,n+3} RP_t + \varepsilon_t \quad (25)$$

where *DIMF* is the IMF stabilization dummy explained above and RP_t is the log first difference of the real oil prices. Now, the number of the lags of the dependent variable is one, which is obtained based on the Schwarz criterion and *N=6*. Note that, using nine lags instead did not change the results. According to the estimation results, which are not reported here, the election dummy variable is significant and correctly signed in the public inflation rate equation, as expected. However, it is not significant in the private inflation rate equation, as our model given in the second section predicts. The Blinder decomposition results show that the 83 percent of the raw differential can be attributed to the differences in the coefficients.[15] In order opportunistic policies to play an important role in the observed difference between the two rates of inflation, the portion of the differential

attributable to the differing coefficients of the election dummy in the regressions should be sizable. The portion of the differential attributed to the differences in the coefficients can be divided in to two parts: The effect due to the difference in the coefficients of the election dummy and that arising due to the differences in the rest of the coefficients. The Blinder decomposition results reinforce our earlier findings: while the effect stemming from the rest of the coefficients is positive (0.47), the effect due to the election dummy is negative (-0.37). This shows that, while the effect of the difference between the rest of the coefficients is to keep public inflation above private inflation, the difference in the coefficients of the election dummy does just the opposite. Hence, in explaining the observed difference between the two inflation rates, the election dummy plays a significant role.[16]

The long-run relationship between public and private inflation

Finally, a further test is carried out to find out whether public and private prices are cointegrated. Table 6 shows the results of the Johansen (1995) cointegration test for the period 1987(1) – 2003(12). The lag length was chosen by Schwarz criterion and found to be 1 (2 for levels of inflation rates). Both the trace and maximum eigenvalue tests indicate the presence of one cointegrating equation.[17]

[Insert Table 6 here]

Cointegration is further evidence of the impact of elections on public prices: it implies that, in the absence of elections (IMF programs

and oil prices as well), public sector prices follow a similar path of that of private prices.

IV. CONCLUSION

Policymakers can use price controls to cope with inflation; however, price controls are not specific to stabilization periods. Incumbents can use such controls for increasing their chances of re-election. Agenor and Asilis (1997), to our knowledge, is the first study that presents a model to analyze the interactions between price controls and electoral considerations. Based on the political business cycle model of Nordhaus (1975), they presented a model that leads to the tightening of price controls just before an election, and relaxing them immediately afterwards. However, they did not differentiate between public and private sector prices. Moreover, the effects of alternative financing mechanisms of widened budget deficits due to such controls on electoral cycles were not analyzed in their paper.

This paper extends this literature in two dimensions. First, we have developed a Nordhaus type opportunistic political business cycle model that takes the budgetary effects of public price controls into consideration. Using this model, we have shown that domestic debt financing of budget deficits gives an incumbent the opportunity to manipulate public prices. In sharp contrast to bond financing, there is no political business cycle under money financing. Second, we have provided empirical evidence for pre-electoral manipulations of public sector prices in Turkey. In the 1987-2003

period around the election times public prices were kept significantly below private sector prices.

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APPENDIX

In this appendix, we present the details for the solution of optimal control problems in bond and monetary financing cases.

Bond financing

Equations 9, 10, and 11 respectively yield

$$\pi_{g,t} = \frac{k}{\theta\delta_1^2}\left(\frac{1}{r} - \lambda_{1,t}\right), \tag{A1}$$

$$x_t = \frac{1}{\alpha}\left(\frac{1}{r} - \lambda_{1,t}\right), \tag{A2}$$

$$\dot{\lambda}_{1,t} = 1 - (\rho + r)\lambda_{1,t}. \tag{A3}$$

The solution of the first-order differential equation given in Equation A3, by making use of the transversality condition (Equation 12), is straightforward:

$$\lambda_{1,t} = \frac{1}{(\rho + r)}\left[1 - e^{(\rho+r)(T-t)}\right]. \tag{A4}$$

Plugging Equation A4 into Equation A1 gives the time path for public inflation, that is, Equation 13 in the text. A similar procedure yields the evolution of real taxes:

$$x_t = \frac{1}{\alpha r(\rho + r)}\left[\rho + re^{(\rho+r)(T-t)}\right]. \tag{A5}$$

Money financing

Equations 19 and 20 give

$$\mu_t = \frac{[\alpha k(k-m_t) - \theta\delta_1\delta_2]\pi_{g,t} + \delta_1 m_t \lambda_{2,t}}{\theta\delta_2^2 + \alpha(k-m_t)^2}, \tag{A6}$$

$$\dot{\lambda}_{2,t} = -\alpha\mu_t(k\mu_t - m_t\mu_t - k\pi_{g,t}) + (\delta_1\pi_{g,t} - \delta_1\mu_t - \rho)\lambda_{2,t}. \tag{A7}$$

Solving Equation 18 and plugging Equation A6 into the resulting equation yields

$$\pi_{g,t} = \frac{\delta_1 m_t \lambda_{2,t}[-\theta\delta_2 + \alpha m_t(k-m_t)]}{\theta\alpha k(k-\delta_1 m_t)}. \tag{A8}$$

These three equations together with Equation 16 form a system of non-linear differential equations.

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ENDNOTES

1. This importance still continues: IMF programs in recent crisis countries refer to public sector pricing policies. See, for example, various letters of intents of Brazil, Indonesia, Thailand, and Turkey, among others (IMF (1998), IMF (1997a), IMF (1997b), and IMF (2001), respectively).

2. Note that this is a simplifying assumption that is usually made in political cycles literature to abstract from complications arising from the modeling of the demand side of the economy, and our treatment is in line with this literature. See, for example, Drazen (2000, pp. 234).

3. Bonds can be considered as inflation indexed.

4. This assumption is in line with Nordhaus (1975) and Agenor and Asilis (1997). Note that even voters are rational and forward looking, it is possible to obtain retrospective voting behavior. Rogoff and Sibert (1988) and Rogoff (1990) developed such models. On this issue, see for example, Alesina *et al.* (1997, pp. 33-36) and Drazen (2000, pp. 237-38).

5. The assumption that the vote function is linear in terms of the third argument simplifies the algebra.

6. Solution details are given in the Appendix.

7. We give these equations in the Appendix.

8. Another implication of debt financing is to blur the correlation between inflation and public deficits. See, for example, Blanchard and Fischer (1989, pp. 512-517).

9. Alesina *et al.* (1997, chapter 7) found significant electoral cycles in monetary policy for a set of 18 OECD countries for the period 1969 – 1993. Recently, Easaw and Garratt (2000) concluded that in pre- and post-election periods between 1979 and 1992, the British government expenditure had been affected by political motives. See the discussion in Drazen (2000, pp. 238 - 46).

10. The inflation rate is measured as the logged first differences of the relevant price index. Data for the breakdown of the manufacturing wholesale price index is published by the State Institute of Statistics. We used the 1987=100 index. The monthly data starting from 1984(1) onwards is available from the web page of the Central Bank of Turkey: www.tcmb.gov.tr. Crude oil prices are obtained from various issues of the Main Economic Indicators of the State Planning Organization.

11. Kara *et al.* (2005) documented the importance of exchange rate pass-through in Turkey. Günçavdı and Orbay (2002) showed the importance of the changes in the nominal exchange rate in determining the price cost margin in Turkey. Following Gali and Gertler (1999) inflation determination model, Celasun *et al.* (2004) used the real exchange rate as a proxy for the real marginal cost in their inflation equations for some emerging economies.

12. Note the timing of three negative differences after elections, which are not compatible with the theory: one occurred in 1988(1) -two months after the 1987(11) election, while the other two occurred two and six months following the 1994(3) election. Note that, as evident from Table 3, the difference between the public and private inflation rates jumped record high levels one month after each of these two elections (and just before these three negative observations). The severity of the public inflation hike is also observable in the last two columns of Table 3. After two such big jumps, it might be the case that, for a period of a few months, the necessity for an additional and significant public price increase did not arise, whereas private inflation started to pick-up as a response to those unprecedented hikes. Put another way, the reason behind these negative differences after those two elections could be the public price hikes just after elections (as the theory suggests).

13. In fact the second program would have terminated in February 2002. However, after the February 2001 crisis, in May 2001 a new program which was completely different than the existing one (for example, a floating exchange rate regime versus a pre-announced crawling peg system) was put into place and supported by an additional and significant amount of credit from the IMF. In rhetoric, the program that started in December 1999 has been shown as ending in February 2002, but this was not the case. For this reason the starting date of the third program is shown as May 2001.

14. We are grateful to an anonymous referee for suggesting this point.

15. The raw differential is defined as

$$R = (\phi_{g,0} - \phi_{p,0}) + (\sum_{i=1}^{n+3} \phi_{g,i} x'_{g,i} - \sum_{i=1}^{n+3} \phi_{p,i} x'_{p,i}), \qquad (26)$$

where x' is the mean of the ith independent variable included in the two versions of Equation 25. The portion of differential attributable to differing coefficients is given by $C = \sum_{i=1}^{n+3} (\phi_{p,i} - \phi_{g,i}) x'_{p,i}$, whereas the portion of differential attributable to differing endowments (in this case only the lagged dependent variables) is defined as $D = \sum_{i=1}^{n} \phi_{g,i} (x'_{g,i} - x'_{p,i})$. Note that R =C + D + U, where U is given by the

first term on the right hand side of Equation 26. For our purposes, more important is the portion of differential attributable to differing coefficients of the election dummy, which is defined as $C_{dpren} = (\phi_{g,n+1} - \phi_{p,n+1})DPREN'$.

16. Following the suggestion of an anonymous referee the sample can also be defined as a panel by taking each period between two elections as the time element and various elections as the cross-section element. This can help to control for the effects arising from factors that may differ from one election cycle to the other and not considered in Equation 24. An18-month window before and after each general election was taken. Together with the election month, this constitutes a time series of 37 observations (32 months for the last election). We have five general elections, in total this makes a panel with 135 observations. The results from the GMM and fixed effect procedures were essentially the same with those presented in the paper and thus not reported to save space.

17. To check the robustness of our results we re-performed the cointegration test for a longer time span: 1984(1) – 2003(12). Still, the null hypothesis of no cointegrating vector was rejected at the 1% level.

Table 1. *Elections in the 1987(1) - 2003(12) period*

Election date	Type of the election
1. November 29, 1987	General
2. March 03, 1989	Municipality
3. October 20, 1991	General
4. March 27, 1994	Municipality
5. December 24, 1995	General
6. April 18, 1999	General + Municipality
7. November 03, 2002	General

Table 2. *Political manipulations of the public sector inflation rate around general and municipality elections: 1987(1) - 2003(12)*
Dependent variable: the difference of the monthly public and private inflation rates; coefficients and t-values (in parantheses)

	The number of lags of the dependent variable (n)					
	n=12	n=12	n=12	n=12	n=9	n=9
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Pre-election dummy (DPREN)						
Length of the election window (N=12)	-0.012		-0.011		-0.012	
	(2.9)***		(2.8)***		(3.1)***	
Length of the election window (N=6)		-0.011		-0.013		-0.014
		(2.7)***		(3.0)***		(3.3)***
Changes in real oil price			0.061	0.07	0.061	0.071
			(2.9)***	(3.3)***	(2.9)***	(3.4)***
Diagnostics						
Adjusted R^2	0.04	0.04	0.08	0.09	0.08	0.08
Residual autocorrelation; p-values						
First order	0.47	0.38	0.25	0.19	0.59	0.44
Twelfth order	0.49	0.28	0.82	0.17	0.57	0.27
Ramsey-Reset test; p-values						
Number of fitted terms: 1	0.62	0.55	0.07	0.18	0.05	0.33
Number of fitted terms: 2	0.43	0.32	0.08	0.28	0.07	0.60
Omitted variables test; p-values						
Changes in real exchange rate	0.80	0.48	0.47	0.74	0.49	0.78
Schwarz criterion	-4.18	-4.18	-4.20	-4.21	-4.26	-4.27

Notes: Estimation results of Equation 24. Coefficients of the constant, autoregressive part and seasonal dummies are not shown. ***, **, and * indicate statistical significance of 1, 5, and 10 percent respectively.

Table 3. *Timing of large deviations of the public sector inflation rates from the private sector inflation rates: 1987(1) - 2003(12)*

	(Public sector monthly % inflation rate) - (Private sector monthly % inflation rate) > sample mean + SD = % 3.19	(Public sector monthly % inflation rate at (t)) / (Public sector annual % inflation rate at (t-1))	Ratio of public sector monthly % inflation rate at (t) to its 12-month moving average at (t-1)
1987(12)	14.3	1.04	13.67
1989(01)	4.8	0.19	2.87
1989(07)	6.7	0.18	2.67
1989(11)	3.2	0.08	1.27
1989(12)	4.7	0.10	1.60
1990(09)	7.2	0.26	3.76
1990(10)	4.1	0.14	2.04
1991(08)	6.1	0.13	1.97
1992(01)	8.5	0.27	3.95
1994(04)	22.0	0.82	12.58
1994(12)	6.3	0.10	1.55
1996(01)	3.6	0.21	3.05
1996(03)	6.4	0.21	3.06
1996(04)	6.8	0.20	3.05
1997(07)	7.4	0.19	2.90
1999(07)	6.2	0.18	2.69
1999(12)	7.5	0.14	2.30
2001(04)	6.7	0.69	9.22
2003(01)	3.4	0.23	3.10

Table 3. *(continued)*

	(Public sector monthly % inflation rate) - (Private sector monthly % inflation rate) < sample mean - SD = % -2.81	(Public sector monthly % inflation rate at (t)) / (Public sector annual % inflation rate at (t-1))	Ratio of public sector monthly % inflation rate at (t) to its 12-month moving average at (t-1)
1987(01)	-3.4		
1987(10)	-3.9	0.03	0.36
1987(11)	-3.4	0.07	0.91
1988(01)	-3.8	0.16	2.21
1988(09)	-2.9	0.03	0.52
1994(02)	-4.7	0.12	1.74
1994(03)	-5.8	0.06	0.86
1994(05)	-7.0	0.03	0.60
1994(10)	-3.5	0.02	0.36
1998(03)	-2.9	0.01	0.18
1998(04)	-2.9	0.02	0.30

Table 4. *Large differences between the public and private inflation rates, election times, and IMF programs*

Date of large difference	Number of months leading (-) or lagging (+) an Election date	IMF program
Positive differences		
1987(12)	(+1)	
1989(01)	(-2)	
1989(07)	(+4)	
1989(11)	(+8)	
1989(12)	(+9)	
1990(09)		
1990(10)		
1991(08)	(-2)	
1992(01)	(+3)	
1994(04)	(+1)	
1994(12)		(+5)
1996(01)	(+1)	
1996(03)	(+3)	
1996(04)	(+4)	
1997(07)		
1999(07)	(+3)	
1999(12)	(+8)	(0)
2001(04)		(-1)
2003(01)	(+2)	
Negative differences		
1987(01)	(-10)	
1987(10)	(-2)	
1987(11)	(0)	
1988(01)	(+2)	
1988(09)	(-6)	
1994(02)	(-1)	
1994(03)	(0)	
1994(05)	(+2)	
1994(10)	(+6)	
1998(03)		
1998(04)		

Table 5. *Political manipulations of the public sector inflation rate around elections: 1987(1) - 2003(12)*

Dependent variable: the difference of the monthly public and private inflation rates; coefficients and t-values (in parantheses)

	The number of lags of the dependent variable (n) and the type of the election (G or G+M)				
	n=9; G+M	n=9; G+M	n=9; G	n=9; G	n=9; G+M
Independent variables	(1)	(2)	(3)	(4)	(5)
Pre-election dummy (DPREN)					
Length of the election window (N=12)	-0.012		-0.007		
	(3.1)***		(1.8)*		
Length of the election window (N=6)		-0.013		-0.01	
		(3.2)***		(2.1)**	
Williams (1990) type counter dummy					-0.0004
					(2.2)**
Changes in real oil price	0.062	0.07	0.062	0.068	0.062
	(3.0)***	(3.5)***	(3.0)***	(3.3)***	(3.0)***
IMF stabilization program dummy	0.059	0.058	0.06	0.059	0.059
	(4.0)***	(3.9)***	(4.0)***	(3.9)***	(4.0)***
Diagnostics					
Adjusted R^2	0.15	0.15	0.12	0.12	0.12
Residual autocorrelation; p-values					
First order	0.95	0.91	0.74	0.74	0.81
Twelfth order	0.80	0.53	0.61	0.62	0.54
Ramsey-Reset test; p-values					
Number of fitted terms:1	0.69	0.88	0.87	0.83	0.25
Number of fitted terms:2	0.06	0.37	0.14	0.29	0.35
Omitted variables test; p-values					
Changes in real exchange rate	0.39	0.65	0.35	0.52	0.37
Schwarz criterion	-4.32	-4.32	-4.28	-4.29	-4.29

Notes: Estimation results of Equation 24. Coefficients of the constant, autoregressive part and seasonal dummies are not shown. ***, **, and * indicate statistical significance of 1, 5, and 10 percent respectively.

Table 6. *Johansen test for cointegration*

Eigenvalue	Trace statistics	1% critical value	Maximum eigenvalue statistic	1% critical value	H_0: Number of cointegrating equations
0.16	36.6	16.3	35.3	15.7	None***
0.01	1.2	6.5	1.2	6.5	At most 1

Normalized coefficients of the cointegration equation (standard error in paranthesis)

Public sector price	Private sector price
1.000	-1.044
	(0.004)

Notes: The lag length was found based on the Schwarz criterion and equal to 1 (in differences). Critical values are from Osterwald-Lenum (1992).*** denotes significance at the 1% level.