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Abstract

We analyze the effectiveness of some commonly discussed anti–corruption reforms on political corruption, using a theoretical model of competition between two candidates in a probabilistic voting setup. Candidates, who may differ both in their ability to produce the public good, and popularity with voters, propose a tax rate and a public good level. The budget constraint implies that taxes collected must equal the sum of funds used in public good production plus funds stolen by the elected politician. We identify the conditions under which constitutional constraints on policies, higher penalties for corruption, and higher wages for elected politicians increase (or decrease) voters' welfare. We discuss how the asymmetric information and the rigidity of constitutions reduce the effectiveness of the reforms, and how distributional effects of reforms may reduce the voters' support for a welfare–improving reform. Finally, we argue that effective reforms may not be proposed by both corrupt and *honest* politicians.

JEL Codes: D72, H30, H83, K42.

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1 Introduction

According to Transparency International's 2005 Global Corruption Barometer, GCB, a survey given to 55,000 people in low, medium and high income countries, citizens in 45 (out of 69) countries considered political parties as the institution most affected by corruption. This is an increase from last year, when it was 36 out of 62, (GCB 2005 p.3). For many voters political corruption is not only common but also a most harmful problem, "..if citizens could wave a magic wand to eliminate corruption from just one institution, more would choose to clean up political parties than any other institution.", GCB 2003. Of course a politician as well as anyone else may decide to commit a corrupt act. However, in a democracy any politician who wants to be reelected incorporates the effect of his actions on his support from the electorate in subsequent elections. Yet, given voters' dislike of corruption and politicians' desire for reelection, it seems paradoxical that in many democracies political corruption is widespread, and corrupt politicians win the elections repeatedly. In this paper we analyze the effectiveness of some commonly discussed anti-corruption reforms and consider the potential difficulties with their implementation.

To model political corruption we use a generalized version of Polo's (1998) model of political agency. In that world, the voting decision is subject to random, unpredictable swings (probabilistic voting). Candidates can be differentiated from one another in terms of dimensions other than corruption,

e.g., with respect to their ability to produce the public good or their popularity. In the model, expected rent maximizing candidates propose fiscal policy platforms, where the amount they steal from the public treasury is implicitly defined by the difference between revenues and public good costs. Candidates thus choose the amount they steal along with the policy platforms they propose. A candidate's incentives to steal will increase in his ability/popularity advantage over his rival and in the extent of randomness in voter loyalties. Polo's analogy to the context of price competition between two firms helps explain this point. Consider two firms that select price and quality of their respective products, in a context where there is uncertainty about their relative demands. Bertrand competition will then allow firms to price above cost and select suboptimal qualities. Using the same analogy, anti–corruption reforms are rules to regulate the political marketplace. We identify the conditions that characterize the equilibrium of the political competition game, and then evaluate the effect of (i) constitutional constraints on tax rates and public good levels, and (ii) higher salaries for politicians or harsher punishment for corruption, on an aggregate measure of voters' welfare.

Brennan and Buchanan (1980) models the state as a monopoly and analyze the effects of constitutional restrictions on its power to tax. One possible restriction is a limit on tax rates, Brennan and Buchanan (1980, ch. 10). They study the effects of constraints under the assumption of a monopoly govern-

ment for whom theft constitutes the sole source of rents. In our investigation, however, we study the effects of tax constraints in a setting with duopolistic competition and multiple sources of rents. We find that tax constraints are effective in the case where the competing candidates are *ex ante* identical, but may be counterproductive when they are not. In their model voters' income increases in public good level, and decreases in tax rate, i.e., the Laffer curve. That assumption, combined with the monopoly power of the state, makes limits work in Brennan and Buchanan (1980). In contrast, we assume exogenous income levels, yet, we find that political competition, by producing an effect similar to Laffer curve on a candidate's expected rents, makes tax rate limits effective when identical candidates compete. For heterogenous candidates we provide an example where in the equilibrium only the popular candidate who is proposing lower taxes is stealing. Then, we show that, any tax limit will reduce voters' welfare. We also show that when candidates are identical, tax rate limits enforcing a small government is not the only welfare increasing policy. A constitutional constraint on public good level that enforces a large government is also welfare increasing. These two constraints can be considered as price and quality regulations in a duopoly, and they are complimentary in general.

A commonly proposed reform to reduce the illegal appropriation of public funds is to increase the legal compensations of politicians or the penalties

for corruption, e.g., as suggested by Becker and Stigler (1974). In the market analogy, salary reform corresponds to a prize (financed by consumers) given to the firm with the highest sales. In that case, a firm has incentives to increase its sales, which can be accomplished by proposing a better price-quality ratio, i.e., lowering the level of corruption. Increasing the wage is, however, costly, since customers eventually finance the wage bill. We find that when the candidates are identical, and, there are no legal penalties for corruption, the benefit of wage increase (lower corruption) justifies the cost. But in the presence of legal penalties or when one candidate is not corrupt, this is not always the case. When legal incentives are very strong (a high probability of getting caught and resultant harsh penalties), a candidate will remain honest no matter what the electoral incentives. When the legal incentives are weak, the political competition game may have multiple (two) equilibria: either both candidates stay honest or at least one steals. In terms of anti–corruption effects, one has to be careful. Since the legal incentives reduce the expected rents from the office, a small increase in legal penalties can raise corruption and lower welfare.

In Propositions 2, 3, 4, and 5, we show when a reform would be welfare increasing. Yet, we argue that a welfare-increasing reform may still not be implemented due to asymmetric information, the rigid structure of constitutions, distributional effects of the reform, and the lack of (both corrupt and honest) politicians' support. In order to calculate the appropriate reforms one requires

information privately hold by candidates, such as how able, popular or honest they are. More importantly since the reforms, such as constitutions, will have long lasting effects, information about both current and future candidates as well as future voters is required. Even if the reformers are fully informed, the rigidity of constitutions reduces the effectiveness of the reforms when the world is not static. The intuition is that then the same incentive scheme has to be used for different agents, –or for the same agents under different circumstances.

The distributional effects of reforms aggravates the effects of imperfect information. Even when they all have the same effect on aggregate welfare the most of the burden of salary reform and constitutional constraints on public good levels is borne primarily by the rich. On the other hand constitutional constraints on tax rates benefits the rich most. Since voters with different incomes have different preferences on reforms, we have another agency problem when electing representatives to design the reform.

Finally, we consider the incentives of politicians to support constitutional constraints. When both candidates are corrupt, it is not surprising that they would have no interest in proposing a reform that would eliminate some of their rents. We argue that even an honest candidate may not want to support such a reform if his opponent is corrupt, since it removes an important source of his competitive advantage.

The incumbency model by Barro(1973) and Ferejohn (1986) and its ex-

tensions and generalizations by Persson, Roland and Tabellini (1997), Adsera, Boix and Payne (2003), Przeworski (2003), Besley (2005) and Besley and Smart (2003) has been helpful to understand political corruption. These models focus on the incentives of incumbents to steal, given that voters have incomplete information about the state of the world, and voters support the incumbent whenever he achieves a minimum performance standard. The minimum performance standard is the (exogenous) expected utility from the challenger. Another approach is that of Caselli and Morelli (2004) who studied what determines the honesty and quality of elected politicians. Unlike us, they allow the quality to be determined endogenously. But in their model corrupt politicians do extract as much rents as they possibly can, i.e., there is no concern for reelection. In their model the large number of players reduces the strategic incentives in rent extraction to zero. The approach that we generalize in this paper, presented first in Brennan and Buchanan (1980) and developed in Polo (1998), differ from both of these approaches by modeling the strategic interaction between candidates. As we discuss after Proposition 5, when both candidates are corrupt, the strategic effects of a reform is important as well. Also the model we study considers citizens with different levels of incomes and different preferences on policies, that allows one to consider the conflict of interest among the voters, as well as the conflict of interest between the voters and the politicians.

In the model, candidates compete only once, yet they keep their election promises. We consider this an approximation to a dynamic model with reputation. The kind of political corruption that this model explains best happens where a small number of political leaders compete with each other repeatedly over a long horizon, rather than political competition under short term limits. The corrupt leaders whose behavior we study are honest thieves: They do keep their promises, because they have future elections to compete, and future rents to gain. In turn, the voters know what to expect from the politicians, and then decide accordingly. Another important assumption is barriers to entry into politics. That is also a feature of political life in countries described above. The barriers may be set endogenously; corrupt politicians would do everything they could to make sure that there are barriers to entry. Although one can think the commitment assumption as too optimistic, and barriers to entry as too pessimistic, they are not necessary for political corruption to occur. Polo(1998) shows that if one removes both of the assumptions, i.e., assumes K candidates but no commitment, corruption still occurs, as voters then expect the candidates to steal, and in turn candidates steal in the equilibrium. The intuition is that a candidate's chance of reelection with probabilistic voting is small when the number of candidates is large.

In summary, modelling it as an agency problem, our model contributes to an understanding of persistence of corruption in democracies in a variety of

ways. Political corruption may stem from factors that are beyond the control of constitution designers, such as the voter loyalty and candidate heterogeneity. Many reforms commonly suggested may increase corruption under certain conditions. It is especially difficult to design an effective reform when one candidate is honest. Even when a reform could improve voter welfare, implementation requires information that reformers may not have. Different reforms have different distributional effects, so there is a conflict of interest among voters. And even when there exists a welfare improving reform that is supported by electorate, it may not be proposed by any of the politicians, corrupt or honest, competing for public office.

Section 2 presents the model and a result, Theorem 1, on the existence and uniqueness of Nash Equilibrium. In section 3, we study the effectiveness of the reforms. We discuss the difficulties with implementing the reforms in section 4, and conclude in Section 5. The proof of Theorem 1, comparative statics, a fully solved example using quasi–linear utility function, and a discussion and generalization of results from the previous literature are provided in a companion paper, Evrenk (2006). The Appendix provides the rest of the proofs.

2 The Model

The Economy: We consider a generalized version of Polo (1998). Let us imagine a society where each voter i has income Y_i, out of which he pays an income tax at flat rate t and consumes the rest. The income in society is distributed over $[Y_{\min}, Y_{\max}]$ with measure $\mu(Y_i)$. The size of the population, N, and the average income $Y = \frac{1}{N}\int Y_i d\mu(Y_i)$ are both normalized to one.

Candidates: There are two political agents (candidates) competing in elections. Simultaneously each agent $j \in \{1, 2\}$ chooses a policy platform, i.e., promises a tax rate, t_j, and a public good level, g_j, which he implements after winning the election. Both agents are expected rent maximizers, and run for the same position, which we call the position of leader. The leader produces the public good from the available public funds using a linear technology, that depends on his (non-verifiable) ability level, α_j. The available public funds that can be used by the leader in the production of public good is equal to collected tax revenues minus the salary of the leader, w, and an amount that he chooses to steal, s_j. Thus the public good delivered when candidate j is the leader is

$$g_j = \alpha_j(t_j - w - s_j). \tag{1}$$

When a candidate wins the election, he is going to get legal rents and will

have access illegal rents. In addition to salary, legal rents include ego rents, η. Following the corruption literature, we assume that there are "leakages" or "deadweight losses" from illegal rents: when the leader diverts a dollar from the public budget, a fraction $1-\theta_j$ will be wasted, so the leader will appropriate only $\theta_j < 1$. This parameter also captures the ethics of the leader, when he is honest $\theta_j = 0$. We assume that a corrupt candidate believes that he will get caught and be punished with probability $p \geqslant 0$. Then, he will be deprived of his position, thus loose the legal rents, both w and η, and will pay a legal penalty $c + vs_j$ with $c \geqslant 0$, and $v \geqslant 0$. Thus, the expected rents that candidate j receives conditional on being elected is

$$R_j(s_j) = w + \eta + \mathbf{1}_{\{s_j>0\}}[\theta_j s_j - p(vs_j + c + w + \eta)]. \tag{2}$$

We assume that if the agent can not win the election, then he receives his outside option, normalized to zero.

Voters: Each voter i has preferences over his consumption of the private good, $c_i = (1-t)Y_i$, and the public good, g. Her preferences over consumption are represented by the utility function

$$U(c_i, g) \ = I(c_i) + \ H(g),$$

where $I(.)$ and $H(.)$ are two strictly increasing, C^2, and concave functions from

R_+ to R with at least one of them being strictly concave. We assume that the most preferred tax rate of a voter decreases in her income, $cI''(c)+I'(c) > 0$ for $c \in [0, Y_{\max}]$. Unlike Polo (1998) we do not assume quasi–linear preferences. Because as he notes, when the marginal utility from private good consumption is constant, the equilibrium public good levels are always optimal, the only effect of corruption is higher taxes.[1] By considering strictly concave $I(.)$, we can study situations where political corruption leads underprovided public goods. However, that relaxation of assumption comes with a cost: When preferences are not quasi–linear, to rule out an equilibrium platform with either zero public good or hundred percent taxes, we assume that the marginal utility of consumption converges to infinity as the good consumed goes to zero, i.e., $\lim_{c\downarrow 0} I'(c) = \infty$, or $\lim_{g\downarrow 0} H'(g) = \infty$,

The voting is sincere but probabilistic. Formally, let

$$U_i^j = U(c_i^j, g_j) + (j-1)\xi_i. \tag{3}$$

where $c_i^j = (1-t_j)Y_i$. Voter i votes for agent j whenever $U_i^j > U_i^k$. If $U_i^j = U_i^k$, then each candidate receives the vote with equal chance. The term $\xi_i = \beta + \beta_2 + \beta_{i2}$ captures the non–policy issues that affect the voting decision, where β is the electorate's average bias in favor of Candidate 2 which is known *ex ante*. A positive (negative) β means Candidate 2 is more (less) popular.

[1] Symmetrically, when $H(.)$ is linear, then the equilibrium tax rates will be first–best.

From the candidates' point of view, the other terms in voter preferences, β_2 and β_{i2}, are independent random variables uniformly distributed on (respectively) $[\frac{-1}{2\sigma}, \frac{1}{2\sigma}]$ and $[\frac{-1}{2\phi}, \frac{1}{2\phi}]$. The first term, β_2, reflects uncertainty about a correlated preference shock, while the second term, β_{i2}, reflects an idiosyncratic shock on individual i's preferences. Note that the voters care about the ethics of a candidate only if it reduces their own consumption.

To measure the welfare effects of the reforms, we use *voters'* expected (purely utilitarian) welfare, $\mathbf{E}[\mathbf{W}]$. After some manipulations it can be written as

$$\mathbf{E}[\mathbf{W}] = \mathbf{E}[U_i((1-t_2)Y_i, g_2(t_2, s_2))] + \beta + \frac{1}{2\sigma}(\rho_1)^2. \tag{4}$$

The policy platform, (t_j^0, g_j^0), which maximizes $\mathbf{E}[\mathbf{W}]$ when adopted by candidate j will be referred as the first–best policy platform for candidate j. It is straightforward to show that the first best involves no corruption, $s_j^0 = t_j^0 - w - \frac{1}{\alpha_j} g_j^0 = 0$, and that the first best tax rate, t_j^0, maximizes the average utility of the electorate, $\mathbf{E}[U_i((1-t_j)Y_i, g_j(t_j))]$. The optimality of zero corruption is intuitive: Given the tax rate, less stealing means higher public goods delivered. On the other hand the optimal tax rate depends on the social welfare function.

2.1 Equilibrium and The Agency Problem

It is straightforward to show that the probability that j wins the elections when he competes with k is,

$$\rho_j = \frac{1}{2} + \sigma[\mathbf{E}[U(c_i^j, g_j) - U(c_i^k, g_k)] + \mathbf{P}_j], \tag{5}$$

where $\mathbf{P}_j = 2(j - \frac{3}{2})\beta$ is the effect of *ex-ante* popularity advantage of candidate j and $\mathbf{E}[f] = \int f d\mu$. Agent j chooses (t_j, g_j) to maximize his expected rents, $\rho_j(t_j, g_j, t_k, g_k)R_j(g_j, t_j)$. Let (t_j^*, g_j^*), $j = 1, 2$ denote a pure strategy Nash equilibrium, PSNE. We say that there is an *agency problem* whenever $(t_j^*, g_j^*) \neq (t_j^0, g_j^0)$ for at least one candidate.

Evrenk (2006) discusses the equilibrium of the political competition game in detail. We show that each candidate selects his policy platform to maximize average voter utility *conditional on* s_j: Due to the assumptions that candidates are rent-maximizing, that voters are equally well informed, and that there are no special interest lobbies, in our model the agency problem exists, if at all, in only one dimension, i.e., stealing. The equilibrium level of stealing is determined by the marginal expected utility of stealing for candidate j,

$$\sigma R_j \frac{\partial \mathbf{E}[U(c_i^j, g_j)]}{\partial s_j} + (\theta_j - vp)\rho_j. \tag{6}$$

If candidate j steals, then (6)=0 at some $s_j^* > 0$. Note that (6) is equal to a

weighted average of two marginal gains: (ii) the marginal disutility of voters from corruption, weighted by a measure of aggregate uncertainty times the rents of candidate j, σR_j, and (ii) the marginal utility from a stolen dollar conditional on being elected, weighted by the probability of winning election, ρ_j. As we discuss in detail in the companion paper,

Theorem 1 *The political competition game,*

(i) has a unique PSNE when there is no law enforcement, $p = 0$,

(ii) has at most two PSNE when there is law enforcement.

We do not have closed form solutions for the equilibrium, which may or may not involve corruption. In the following we consider the set of parameters that give rise to an equilibrium with at least one politician stealing. Then, using the first order conditions, we study the effectiveness of constitutional constraints on policy space, and, the incentives to candidates, on agency problem.

3 Effectiveness of Reforms

3.1 Constitutional Constraints

Geoffrey Brennan and James M. Buchanan (1980) discuss how an individual member of society who decides behind a "veil of ignorance" would like to impose constraints on the political decision-making process or on the domain of the political outcomes to maximize the expected utility of his future selves. An

example would be the Proposition 13, approved by voters in California in 1978, it restricts the tax on real property to 1 percent of market value. Although they first give an example of electoral competition where aggregate uncertainty about the vote shares always lead to an equilibrium where both candidates steal, in the whole book Brennan and Buchanan (1980) use a monopoly (Leviathan) model of state. As Brennan (1998) noted the Leviathan model, which is the exact opposite of the benevolent dictator, is analytically convenient and familiar to the reader. So, it might be useful when the constitutional constraints were first discussed. However, we believe that the effectiveness of constraints on policy space in democracies should be studied using a model of political competition. For that, let us first consider the effect of a constitution with the provision that the tax rate can not exceed T.

Proposition 1 *It is impossible to implement the first best policy platform through imposing only a tax rate constraint.*

Proof. The first order condition with respect to taxes in a Nash equilibrium is

$$\sigma R_j^p \frac{\partial \mathbf{E}[U_i((1-t_j)Y_i, \alpha_j(t_j - w - s_j))]}{\partial t_j} - \lambda_j = 0,$$

where λ_j is a Kuhn-Tucker multiplier satisfying $\lambda_j(t_j - T) = 0$. Suppose that there exists a T that implements the first best. Then in the equilibrium $\lambda_j > 0$, –which implies that the public good level is too small, $\mathbf{E}[Y_i I'(c_i)] < a_j H'(G)$. But, in a first-best the expected marginal utility of electorate with

respect to tax rate should equal zero. Contradiction. ■

Proposition 1 does not mean that a constitutional constraint on tax rate is useless. It simply means that these constraints may provide a benefit, yet they have a cost as well. Our second question is about the second–best: When does a constitutional constraint increase voters welfare in a society with political corruption?

3.1.1 Constitutional constraints when candidates are identical.

Tax Rate Limits: Let us consider two (ex-ante) identical candidates competing with each other in a country with a constitutional constraint at T. Using (6), the equilibrium level of corruption by each candidate, $s^*(T)$, is given by $-\sigma R(s^*(T))[\alpha H'(T-w-s^*(T))] + \frac{1}{2}(\theta - pv) \leq 0$, with equality if $s^*(T) > 0$. In the equilibrium with corruption, the marginal effect of a tax rate limit on the level of stealing can be calculated as,

$$\frac{ds^*(T)}{dT} = \frac{R^p(s^*(T))\alpha H''(g)}{R^p(s^*(T))\alpha H''(g)] - (\theta - pv)H'(g)} \text{ for } s^*(T) > 0,$$

where $g = \alpha(T - w - s^*(T))$. Note that whenever $H(.)$ is a strictly concave function, the derivative, $\frac{ds^*(T)}{dT}$, is strictly positive, hence reducing the tax limit would reduce stealing. But also note that, the derivative is always less than one: The decrease in corruption comes with a cost, a reduction in public good level. So, the net effect of tax rate constraints on voters' welfare is not clear

and needs to be calculated. The effect of an incremental change in T on voters' welfare can be calculated as, $\frac{\partial \mathbf{E}[\mathbf{W}]}{\partial T} = \alpha H'(g)(1 - \frac{ds^*(T)}{dT}) - \mathbf{E}[Y_i I'((1 - T)Y_i)]$. Note that at unconstrained political equilibrium with identical corrupt candidates, $\alpha H'(g^*) = \mathbf{E}[Y_i I'(Y_i(1 - t^*)]$. Thus,

Proposition 2 *Whenever marginal utility from public good is decreasing, ($H(.)$ is strictly concave), and the identical candidates are stealing in the equilibrium, there always exists a constitutional constraint that enforces both candidates to offer a tax rate that is (at least marginally) lower than t^* and that constraint is both corruption reducing and welfare-improving.*

The intuition is that, for a given level of corruption, the tax rate constraints lower g, raising marginal utility of public good. This increases the voters' disutility from corruption in (6). Hence the marginal utility of stolen funds for a candidate becomes negative at s^*. A candidate reduces the level he steals because now the cost of stealing in terms of votes foregone is higher. The difference between Brennan and Buchanan's analysis is not simply that we have two candidates where they have one Leviathan. What derives their result is the assumption that higher public good levels (higher taxes) increase (decrease) the taxable income with the assumption of monopoly power of politician. Our argument incorporates the effect of political competition. In our model, the elasticity of taxable income with respect to either public goods or tax rates is zero, so there is no Laffer curve, yet limits increase voters' welfare. Although

imperfect, the electoral competition is what derives our result and make limits work.

Using a market analogy, constitutional constraints are just rules for regulating the political market. What we have shown is that if we have an ex-ante symmetric duopoly with a special demand in that market, a price cap would increase consumer welfare. Then one wonders, since in our model each firm chooses both its price and quality, what would be the effect of a minimum quality regulation on voters' welfare? That is to ask, how voters' welfare would change if we have a constitutional constraint that requires each candidate to provide at least a minimum level of public good,[2] G?

Public Good Limits: The analysis of public good limits is very similar to the tax rate limits: The first best can not be implemented using only a minimum public good level constraint. Similarly, whenever the marginal utility from private good is strictly decreasing, we have $\frac{-1}{\alpha} < \frac{ds^*}{dG} < 0$. Thus to reduce stealing we need higher levels of G, i.e., another solution to political corruption may be a constitution that enforces a large government.

Proposition 3 *Whenever marginal utility from private good is decreasing, ($I(.)$ is strictly concave), and the identical candidates steal in the equilibrium, there always exists a constitutional constraint that enforces both candidates to offer a public good level that is (at least marginally) higher than g^* and that*

[2] A similar idea can be found in Inman (1985, p.750). In his discussion of limits imposed by citizens on a bureaucrat–politician with monopoly power, Inman considers a contract that allows the monopolist to choose the public good level only from a given interval.

constraint is both corruption reducing and welfare-improving.

The proof of Proposition 3 is in the Appendix. The intuition is that the public good limit increases the taxes, reducing after tax income, and increasing the marginal utility of private good consumption for a voter. That, in return increases a voter's disutility from corruption, and makes it more costly for a candidate.

We have seen that when candidates are identical, under certain conditions both constraints are welfare increasing. Which type of regulation is better for voters? It is not difficult to see that if candidates have the same ability using *both* of the constraints, the first–best can be implemented, –simply setting $T = t^o$, and $G = g^o$ would maximize the voters' welfare. Also note that in that case there is no need for law enforcement or any salary, as the constitution already implements the first–best, at no cost. This strong result heavily depends on the assumptions of symmetric and static environment, a fully informed and benevolent constitutional assembly, –and the assumption that the produced public good levels are verifiable. In the next section we remove symmetry. We discuss the effect of other assumptions in section 4.

3.1.2 Constitutional constraints when candidates are not identical

So far we have discussed identical candidates, but what if the candidates are not identical? Whenever two candidates propose different tax rates in the equi-

librium, the one who proposes the higher tax rate, say Candidate 2, can be targeted by a constitutional limit on tax rates. When Candidate 2 is proposing higher taxes because he is corrupt, and Candidate 1 is proposing lower taxes, because he is honest, the tax rate limits are very effective in reducing the corruption. But in our model abilities of candidates may differ, leading different policy platforms independent of corruption. If that is the case, then the equilibrium may involve the corrupt candidate proposing lower taxes. Then any constitutional constraint on tax rates may reduce voters' welfare. To convey the intuition, let us provide an example. Consider a world with quasi–linear preferences $U = (1-t)Y_i + 2\sqrt{g}$ and one voter $Y_i = 1$. The other parameters of the model are $\alpha_1 = 0.34$, $\alpha_2 = 0.30$, $\beta = 0.06$, $\sigma = 12$, $\theta_1 = \theta_2 = 0.6$, $p = 0$, $w = 0$, $\eta = 0.021$. In the equilibrium, Candidate 1 proposes a tax rate of 34 percent, and Candidate 2 proposes $31\frac{1}{3}$ percent taxes with $g_1 = (0.34)^2$, and $g_2 = (0.30)^2$. In the equilibrium, only the popular candidate, Candidate 2, steals. He steals $1\frac{1}{3}$ percent of total income, and wins the election with a probability of 0.58. Had he stay honest he would win the election with a probability of 0.74. Now, let us consider the effects of imposing tax rate constraints starting from a constraint at 34 percent. A constraint just below 34 percent will bind only for the honest candidate. One can show algebraically that it will *increase* both the probability that Candidate 2 wins the election, ρ_2, and the amount he steals s_2^*. The result is intuitive as we are tying the hands of clean

candidate (he can not offer the optimal platform anymore), the corrupt one's popularity advantage becomes more important. When $T = 31.36$ the limit will be just binding for both candidates. From that point on s_2 will decrease. At $T = 30.03$ percent, candidate 2 is stealing again $1\frac{1}{3}$ percent of total income as before, but, now the probability of him winning the election has increased two percent, to 0.600951. At $T = 30.03$ voters' welfare is lower compared to no limits case, as we are forcing the efficient candidate, Candidate 2, to produce the public good using less than optimal public funds. As we lower the constraint further, the welfare will decrease even more.[3]

3.2 Incentives to Politicians

3.2.1 Small Changes in Penalties

It is clear that with a sufficiently strong legal enforcement, the problem of corruption can be eradicated. For example whenever $pv > 1$, the expected gain from corruption is definitely negative since in that case, $\theta_j - pv < 0$ for any θ_j. Thus when the legal incentives are high enough, no one will steal no matter what the electoral incentives are. Although effective, such strong legal incentives are not always feasible due to administrative and legal constraints. Increasing p is not easy. In Philippines, where two past presidents, Ferdinand Marcos and Joseph Estrada, are believed to embezzle 5 to 10 billion and 78

[3]The analytical solutions to the example is quite tedious. A Mathematica notebook with calculations is available from the author.

to 80 million US dollars (respectively), Eufemio Domingo, the head of the Presidential Commission Against Graft and Corruption, said that "We have all the laws, rules and regulations and especially the institutions not only to curb, but also to eliminate corruption. The problem is that these laws, rules and regulations are not being faithfully implemented....Big time grafters .... are elected and re–elected to government offices." Balgos, (1998, p.267-268), –quoted in Quah (1999). In countries with a significant level of political corruption, p may not be zero, but definitely it is small. Given the weak auditing, one solution is to have a very high punishment when the offender is caught. It makes law enforcement effective, despite the low probability of detection. That quick fix, we think, is not feasible either. In many countries with widespread political corruption, the legal system itself is not very accurate and is subject to influence by the executive branch. To allow one politician to be severely punished may deter not only corruption but also opposition. So we assume that the system has a weak auditing mechanism and significant increases in penalties are not feasible. The following proposition considers the effect of small increases in penalties on corruption.

There is always pressure on politicians from the public and nowadays from multinational organizations for harsher penalties on corruption. Suppose that small increases in penalties are not costly for the voters. Then,

Proposition 4 *A small increase in*

(i) constant penalty, c, always leads to an increase in political corruption,

(ii) variable penalty, v, reduces corruption only when the expected constant penalty is less than the expected legal rents for a corrupt candidate, $pc < (1-p)(w+\eta)$.

Proof. By applying the implicit function theorem on $(6) = 0$. ■

The intuition for (i) is that an increase in c actually reduces the expected rents from office and hence reduces the weight politician puts on voter welfare. Then, the marginal utility of stealing is higher for candidate j, so s_j is higher in the equilibrium. We have the same effect for variable penalty, v, as well. But for the variable penalty there is another effect that works in the opposite direction, the higher the v, the lower is $\theta_j - pv$, i.e., the expected penalty per dollar stolen increases. As the previous ones, that result too depends on the change in the relative weights discussed in (6). If the rents not varying with corruption are positive, $(1-p)(w+\eta) - pc > 0$, then, as v increases, the relative weight on voters' disutility from corruption increases, and the second effect dominates. Thus the equilibrium level of s_j^* will be lower. So, the constant penalty is good only if it is high enough to completely deter corruption. Note that the condition for the effectiveness of a variable penalty will be more difficult to hold when the constant penalty is higher. Thus, in our model, the constant penalty can be justified only when it is sufficiently high.

3.2.2 Wage reform

As Persson and Tabellini (2000) observed in their discussion of Polo (1998), higher ego rents imply lower political corruption. Similar to ego rents, higher wages also makes winning the election more attractive, and reduces the amount each agent steals. The advantage of increasing wages over increasing ego rents is that it is easier to increase the monetary compensation than rents based on psychological factors. After Becker and Stigler (1974), efficiency wages are proposed by many authors in the literature as a solution to bureaucratic corruption. For instance Wittman (1995) in his analysis of "electoral-market competition and the control of opportunistic behavior" says that "...opportunism by politicians is mitigated when they are paid above-market salaries and then threatened with losing the office if they shirk. p. 27" On the other hand, wage increases, –unlike the increases in ego rents,– should be financed from the public budget. Since, a clean government may have a high cost in terms of high wages paid to the political agents, one should calculate not only the effect of wages on corruption, but also the net effect, including the effect of wages on taxes and on public good levels. As derived in Appendix, the total effect of an infinitesimal increase in wage, w, on (expected) voter welfare is

$$\frac{d\mathbf{E}[\mathbf{W}]}{dw} = -\sum_{j\in\{1,2\}} \rho_j \alpha_j \frac{d\mathbf{E}[U_i(.)]}{dg}(1 + \frac{ds_j^*(w)}{dw}). \tag{7}$$

That implies, if we increase the wage candidate j receives, this will increase voter welfare only when the benefit of high wages (a decrease in s_j and hence an increase in g_j) is larger than the cost of high wages (an increase in taxes), i.e., only when $\frac{ds_j^*(w)}{dw} < -1$. Also note that the net benefit from one candidate affects voters' welfare proportional to the likelihood of that candidate winning the election. The next proposition, proved in the Appendix, characterizes conditions under which wage increases are welfare increasing given that both candidates are corrupt.

Proposition 5 *If both candidates steal in the equilibrium, then for a small increase in wages to be welfare-increasing, a necessary condition is* $\min\{\theta_1, \theta_2\} - pv < 1 - p$*, while a sufficient condition is* $\max\{\theta_1, \theta_2\} - pv < 1 - p$.

When they work, both higher v and higher w reduce equilibrium corruption in two channels. There is a "direct" effect increasing the relative weight on voters' disutility on (6). For instance the higher wages increase the rents from the office and hence the weight the candidate puts on voter welfare goes up, inducing lower corruption. The "strategic" effect, on the other hand, works on the last part of (6): a rival candidate also reduces his corruption, ρ_j is now lower, which further reduces the incentives to steal. Obviously the strategic effect occurs only when the rival candidate is also corrupt. Also, when one candidate is honest, he will be paid the higher salary, although he would not steal without it. Lemma 2 in Appendix provides the condition for $\frac{ds_j^*(w)}{dw} < -1$,

when only one candidate is corrupt.

4 Political Economy of the Reform

In section 3, we studied the conditions under which each reform is welfare increasing. In this section we argue that even when constitutional constraints or salary reform are welfare-increasing, they may not be implemented. Note that we do not consider the problems with the implementation of effective legal enforcement here. Unlike the other three reforms, effective legal enforcement requires effective institutions not just passing some laws. Since we have not explicitly modelled the working of these institutions, we can not discuss the possible problems with improving them within our model. For the other reforms, the asymmetric information, and rigidity of constitutions may reduce the effectiveness of the reform; the redistributive effects of the reform may reduce voters' support for effective reforms; and, both corrupt and *honest* politicians' may not support the reform.

Using regulation analogy; a fully informed and benevolent regulator can implement the first–best by simply assigning the quality and quantity levels for each duopolist. Yet, if either the quality of information or the incentives of the regulator are not as assumed, the regulation is not necessarily welfare-increasing. An important difference between regulation and the reforms we study is that these rules, for instance constitutions, last longer than a specific

regulatory rule. So, to design effective rules, information about both the current and future parameters of the model is needed. The information about the candidate abilities and the voter incomes is required to determine the first–best policy platforms for each candidate for each period. In general one also needs to know the level of honesty and popularity of each candidate to design the most effective reform. More importantly, since these rules will apply for many periods, any variation in future parameters reduce the potential effectiveness of the reform, –even when the designers of the reform have perfect information about the parameters. That is because, whenever the world is not static, the reform should be designed for the average types. Then, the limits, for instance, will be too tight when the candidates are better, and too loose when the candidates are worse, than the average. A quote from Hume in Brennan and Buchanan (1980), –"in contriving any system of government, and fixing the several checks and controls of constitution, every man ought to be suppose a knave, and to have no other end, in his all actions, than private interest" – makes us think that the optimal rules should be designed under the assumption that all politicians are totally corrupt, not because they will be, but if we are protected from the worst then we are protected from all.[4] This idea would be correct only when such restrictions are costless.

[4]One of the authors, Geoffrey Brennan in a recent book, Brennan and Hamlin (2000), notes the importance of "economising on virtue" where he describes his new position as "this marks a sharp departure from earlier writing... where the assumption of self-interested motivation is defended in the constitutional context."

It is clear that typically voters will not have access to the detailed information that we mentioned above. Yet, it is quite possible that, on these issues, some members of the society, maybe honest politicians, judges, activists, journalists, or even academics, are better informed. Can an uninformed voter, then, delegate the task of designing the reform to another voter? The answer is not in the affirmative. Each reform has redistributive effects, and there is a conflict of interest among voters with different incomes on the definition of the optimal reform. For instance, consider the effect of tax rate limits on the welfare of different voters when candidates are identical. The change in voters' welfare due to an infinitesimal decrease in tax rate limit, is equal to

$$\mathbf{E}[Y_i I'((1-T)Y_i)] - H'(g(T))\alpha(1-\frac{ds^*}{dT}). \tag{8}$$

The first term measures the (average) benefit due to lower taxes, i.e., higher private good consumption, and the second term measures the cost, lower public good consumption. On the other hand, the effect of a tax rate limit on the welfare of voter i is

$$Y_i I'((1-T)Y_i) - H'(g(T))\alpha(1-\frac{ds^*}{dT}). \tag{9}$$

Comparing (8) and (9), note that the cost is unchanged, as everyone consumes the same amount of public good, but the benefit for every citizen depends on

his income. And since we assume that the most preferred tax rate decreases in income, $cI''(c) + I'(c) > 0$, a voter's benefit is increasing in his income, $\frac{d(Y_i I'((1-T)Y_i))}{dY_i} > 0$. Intuitively the higher the income of the citizen, the larger is his benefit, the reduction in his tax burden, due to lower taxes. Similarly, one can show that for both minimum public good limits and the salary reform, the cost of the reform (higher taxes), is increasing in income, while its benefit, (higher public good consumption), is constant. This time everyone pays the cost, higher taxes. Since taxes are proportional to income, the rich pay a proportionally higher fraction of the cost. The benefit from the reform, higher public good level, is distributed equally. This conflict of interest among voters when combined with the voters' lack of information makes it especially difficult to convince an uninformed (supra)majority that a given reform will increase their current and future welfare. The fact that elections do not give enough incentives to agents to maximize aggregate welfare does not necessarily mean that if *some* members of society design a reform, it will give the right incentives.

The voters' support, although is necessary, may not be sufficient for the reform to be implemented. We have political corruption to begin with exactly because there is an agency problem: a policy that the electorate appreciates, clean government, is not being implemented. In our setup, if all candidates agree not to propose the reform, it will never be implemented and the corruption among the political leaders will continue. An interesting question,

then, is whether the politicians will support the reform. A utility-maximizing politician should compare the benefits and costs of the reform for himself. Adding the reform to policy platform would increase his vote shares in current elections, yet curbing corruption might reduce his current and future payoffs. Since this problem is also a dynamic one and our model is static, we discuss it only informally here.[5]

Let us first consider the candidates' support for constitutional constraints. When both candidates are corrupt it is not difficult to see that if the illegal rents from the corrupt status quo are significantly high, then each of the (corrupt) candidates would rationally choose not to propose the reform, –because then even if the candidate who propose the reform wins the election for sure, his expected rents decreases. One may be inclined to think that this corruption trap is possible only when all the politicians are corrupt. Since an honest politician does not steal, he will incur no cost by supporting the reform. This reasoning is, however, not always correct. Consider an honest leader, Candidate 1, who is going to compete with a corrupt rival in the next election. A successful reform that will prevent all future corruption will affect the policy platform of Candidate 2 in future elections. It will induce Candidate 2 to offer a more voter friendly platform. This will reduce the honest candidate's vote share. So, the honest candidate may also not propose the reform. The reason

[5] We discuss politicians' support for the reform in a simpler setting with three candidates in Evrenk(2004).

is that political competition is a zero sum game without corruption, but not with corruption. The existence of corruption benefits both candidates, even when one of the candidates is completely honest. When one candidate is corrupt, he is better off, since he can get the illegal rents. The (honest) competitor is better off because by stealing the candidate makes his policy platform less attractive and hence the policy platform of his rival becomes more attractive. When the choice to be corrupt is no longer available, the corrupt candidate is going to lose his rents, but the honest one will lose some of his voters.

The salary reform, on the other hand is different, since then the salaries of both candidates increases. It might even be the case that both voters and the candidates support the salary reform. Yet, still there is a conflict of interest as then the candidates could ask for salaries higher than the welfare maximizing level. One can formally show that, if a wage increase is also welfare increasing, and the candidates are allowed to propose their wages as part of their policy platform (with t, and g)„ then, in the equilibrium, (i) they will not steal, and (ii) for c small enough, voters' welfare will *decrease.*

5 Conclusion and Future Research

In this paper, we studied the effectiveness of constitutional constraints and the salary reform in reducing the political corruption and increasing the voters' welfare. In a static model we analyzed the effects of each reform using

a model of political competition between two candidates under probabilistic voting. We discussed other difficulties that reformers would face, such as informational problems and the conflict of interest among voters, in a dynamic setup. We also argued that politicians themselves, honest and corrupt, may oppose anti-corruption reforms. We are planning to extend our analysis in following directions: (i) campaign financing, (ii) candidates with ideological motivations, and (iii) Principal-Agent analysis when the agent has some authority over the principle.

6 Appendix

Proof of Proposition 3. For $s^*(G) > 0$, one can calculate that,

$$\frac{ds^*}{dG} = \frac{1}{\alpha} \frac{R^p(s^*(G))\mathbf{E}[Y_i^2 I''(1-\frac{1}{\alpha}G-s^*(G)-w)]}{R^p(s^*(G))\mathbf{E}[Y_i^2 I''(1-\frac{1}{\alpha}G-s^*(G)-w)]-(\theta-pv)\mathbf{E}[Y_i I'(1-\frac{1}{\alpha}G-s^*(G)-w)]}.$$

When $H(.)$ is strictly concave, $-\frac{1}{\alpha} < \frac{ds^*}{dG} < 0$. The total effect of public good limits on voters' welfare, $\frac{\partial \mathbf{E}[\mathbf{W}]}{\partial G}$, is equal to $\alpha H'(G) - \mathbf{E}[Y_i I'((1-t)Y_i)](\frac{1}{\alpha} + \frac{ds^*}{dG})$. Note that at unregulated political equilibrium, (t^*, g^*), we have $\alpha H'(g^*) = \mathbf{E}[Y_i I'((1-t)Y_i)]$ Thus at $G = g^*$, we have $\frac{\partial \mathbf{E}[\mathbf{W}]}{\partial G} > 0$. ■

Lemma 1 $\frac{d\mathbf{E}[\mathbf{W}]}{dw} = -\sum_{j\in\{1,2\}} \rho_j \alpha_j \frac{d\mathbf{E}[U_i(.)]}{dg}(1 + \frac{ds_j^*(w)}{dw})$

Proof. The derivative of $\mathbf{E}[\mathbf{W}]$ with respect to w is

$$\frac{d\mathbf{E}[U_i((1-t_2(w))Y_i, g_2(w))]}{dw} + \rho_1\left(\frac{d\mathbf{E}[U_i((1-t_1(w))Y_i, g_1(w))]}{dw} - \frac{d\mathbf{E}[U_i((1-t_2(w))Y_i, g_2(w))]}{dw}\right)$$

$$= ((1-\rho_1)\frac{d\mathbf{E}[U_i((1-t_2(w))Y_i, g_2(w))]}{dw} + \rho_1 \frac{d\mathbf{E}[U_i((1-t_1(w))Y_i, g_1(w))]}{dw}).$$

Note that, $\frac{d\mathbf{E}[U_i((1-t_j(w))Y_i,g_j(w))]}{dw}$ is equal to

$$\frac{\partial\mathbf{E}[U_i((1-t_j(w))Y_i,g_j(w))]}{\partial t_j}\frac{dt_j(w)}{dw}+\frac{\partial\mathbf{E}[U_i((1-t_j(w))Y_i,g_j(w))]}{\partial s_j}\frac{ds_j^*(w)}{dw}+\frac{\partial\mathbf{E}[U_i((1-t_j)Y_i,\alpha_j(t_j-w-s_j))]}{\partial w}.$$

By the f.o.c for the tax rate the first term is zero, so we have

$$\frac{d\mathbf{E}[U_i((1-t_j(w))Y_i,g_j(w))]}{dw}=\frac{\partial\mathbf{E}[U_i((1-t_j(w))Y_i,g_j(w))]}{\partial s_j}\frac{ds_j^*(w)}{dw}+\frac{\partial\mathbf{E}[U_i((1-t_j)Y_i,\alpha_j(t_j-w-s_j))]}{\partial w}.$$

As a last step note that,

$$\frac{\partial\mathbf{E}[U_i((1-t_j(w))Y_i,g_j(w))]}{\partial s_j}=\frac{\partial\mathbf{E}[U_i((1-t_j)Y_i,\alpha_j(t_j-w-s_j))]}{\partial w}=-\alpha_j\frac{\partial\mathbf{E}[U_i(c_i^j,g_j)]}{\partial g}.$$

Thus, $\frac{d\mathbf{E}[U_i((1-t_j(w))Y_i,g_j(w))]}{dw}=-\alpha_j\frac{\partial\mathbf{E}[U_i(c_i^j,g_j)]}{\partial g}(1+\frac{ds_j^*(w)}{dw})$, and

$\frac{d\mathbf{E}[\mathbf{W}]}{dw}=-\sum_{j\in\{1,2\}}\rho_j\alpha_j\frac{d\mathbf{E}[U_i(.)]}{dg}(1+\frac{ds_j^*(w)}{dw})$. ■

Proof of Proposition 4. Taking the derivative of first order conditions and noting that the derivative of $\frac{\partial\mathbf{E}[U_i((1-t_j)Y_i,\alpha_j(t_j-W-s_j))]}{\partial t_j}$ with respect s_j is equal to the derivative with respect to wage, w, we have the following equation, $\begin{bmatrix}\frac{\partial^2(\rho_1^*R_1^*)}{(\partial s_1)^2} & \frac{\partial^2(\rho_1^*R_1^*)}{\partial s_1\partial s_2}\\ \frac{\partial^2(\rho_2^*R_2^*)}{\partial s_1\partial s_2} & \frac{\partial^2(\rho_2^*R_2^*)}{(\partial s_2)^2}\end{bmatrix}\begin{bmatrix}\frac{ds_1^*}{dw}\\ \frac{ds_2^*}{dw}\end{bmatrix}=\begin{bmatrix}-\frac{\partial^2(\rho_1^*R_1^*)}{\partial s_1\partial w}\\ -\frac{\partial^2(\rho_2^*R_2^*)}{\partial s_2\partial w}\end{bmatrix}$. The solution is

$$\left[\frac{ds_j^*}{dw}\right]=\begin{bmatrix}\frac{\partial^2(\rho_j^*R_j^*)}{\partial s_j\partial s_k}\frac{\partial^2(\rho_k^*R_k^*)}{\partial s_k\partial w}-\frac{\partial^2(\rho_k^*R_k^*)}{(\partial s_k)^2}\frac{\partial^2(\rho_j^*R_j^*)}{\partial s_j\partial w}\\ \hline \frac{\partial^2(\rho_1^*R_1^*)}{(\partial s_1)^2}\frac{\partial^2(\rho_2^*R_2^*)}{(\partial s_2)^2}-\frac{\partial^2(\rho_1^*R_1^*)}{\partial s_1\partial s_2}\frac{\partial^2(\rho_2^*R_2^*)}{\partial s_1\partial s_2}\end{bmatrix}.$$

By Corollary 1 from Evrenk (2006), $D=\frac{\partial^2(\rho_j^*R_j^*)}{(\partial s_j^*)^2}\frac{\partial^2(\rho_k^*R_k^*)}{(\partial s_k^*)^2}-\frac{\partial^2(\rho_j^*R_j^*)}{\partial s_j^*\partial s_k^*}\frac{\partial^2(\rho_k^*R_k^*)}{\partial s_k^*\partial s_j^*}<0$.

Thus

$$\frac{ds_j^*}{dw}<-1 \text{ iff } \frac{\partial^2(\rho_j^*R_j^*)}{\partial s_j\partial s_k}\frac{\partial^2(\rho_k^*R_k^*)}{\partial s_k\partial w}-\frac{\partial^2(\rho_k^*R_k^*)}{(\partial s_k)^2}\frac{\partial^2(\rho_j^*R_j^*)}{\partial s_j\partial w}>-D. \qquad (10)$$

An increase in legal and illegal rents have same effect on equilibrium policies, $\frac{\partial t_j^*}{\partial s_j} = \frac{\partial t_j^*}{\partial w}$, thus $\frac{dg_j^*}{ds_j} = \frac{dg_j^*}{dw}$. Using this,

$$\frac{\partial^2(\rho_j^* R_j^*)}{\partial s_j \partial w} = \frac{\partial^2(\rho_k^* R_k^*)}{(\partial s_k)^2} + \frac{\partial^2(\rho_j^* R_j^*)}{\partial s_j \partial s_k} - A_j,$$

where $A_j = \alpha_j \sigma[1 - p - \theta_j + pv]H'(g_j^*)$. Using this in (10) gives us

$$\frac{ds_j}{dw} < -1 \text{ iff } \frac{\partial^2(\rho_j^* R_j^*)}{\partial s_j \partial s_k} A_k - \frac{\partial^2(\rho_k^* R_k^*)}{(\partial s_k)^2} A_j > 0.$$

By Lemma 3 from Evrenk (2006), $\frac{\partial^2(\rho_j^* R_j^*)}{\partial s_j \partial s_k} > 0$ and $\frac{\partial^2(\rho_k^* R_k^*)}{(\partial s_k)^2} < 0$. Thus $\min\{A_k, A_j\} > 0$ is necessary and $\max\{A_k, A_j\} > 0$ is sufficient for $\frac{ds_j^*}{dw} < -1$. ■

Lemma 2 *When only candidate j steals in the equilibrium, we have*

$\frac{ds_j}{dw} < -1$ *iff* $\theta_j - pv < \frac{1-p}{[1+\frac{\alpha_k H'(g_k^0)}{\alpha_j H'(g_j^*)}]}$.

Proof. When only candidate j steals $\frac{ds_j}{dw} = \frac{-\frac{\partial^2(\rho_j^* R_j^*)}{\partial s_j \partial w}}{\frac{\partial^2(\rho_j^* R_j^*)}{(\partial s_j)^2}}$, which implies

$\frac{ds_j}{dw} < -1$ iff $\frac{\alpha_j}{\alpha_k} \frac{1-p+\theta_j-pv}{\theta_j-pv} < \frac{\frac{\partial \mathbf{E}[U_i(t_k^o, g_k^o)]}{\partial g}}{\frac{\partial \mathbf{E}[U_i(t_j^*, g_j^*)]}{\partial g}}$.Rearranging the terms, we obtain the condition above. ■

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