

**Supplement for “In Search of the Holy Grail: Policy Convergence, Experimentation  
and Economic Performance”**

**Sharun W. Mukand and Dani Rodrik**

In what follows we sketch out the proofs for the lemma and propositions I and II in the paper.

LEMMA I: We solve for a fixed-point  $\delta_1^*$ , such that all countries in the leader cohort with  $\delta \leq \delta_1^*$  prefer a corrupt policy, while all countries with a  $\delta > \delta_1^*$  prefer to experiment. Consider first the citizen’s voting decision: in period 1, the incumbent is retained with probability  $\pi = \text{prob}(c_i > \psi_1 R) = \frac{\bar{c} - \psi R}{\bar{c}}$ , since  $c \sim U[0, \bar{c}]$ . Now suppose that there exists a  $\delta_1$  such that  $\psi_1 = \text{prob}(\delta < \delta_1) = G(\delta_1)$ . This implies that from the citizen’s perspective the probability that the government will be retained is given by the relationship  $\pi_1 = 1 - \frac{RG(\delta_1)}{\bar{c}}$ , such that associated with every  $\delta$  is a corresponding  $\pi_1$ . Notice that this implies a negative relationship between  $\pi$  and  $\delta$ . We now turn to the government’s problem. Here a government will be indifferent between experimentation or corruption if  $V^{xpmt} = V^{corr}$ . This latter equality is true if  $-\theta\sigma_\eta^2 + \pi^X r = -\theta\delta^2 + \pi^C[(\phi - 1)R + r]$ . Simplifying, we obtain  $\pi_1 = \frac{\theta\delta^2 - \theta\sigma_\eta^2}{(\phi - 1)R}$ . Observe that the government’s optimization gives a positive relationship between  $\delta$  and  $\pi$ . For there to be a fixed-point equilibrium, we need a  $\delta_1^*$  that simultaneously solves both the government’s policy choice rule as well as the citizen’s optimal voting rule. Given the continuity of the underlying functions, since the relationship between  $\delta$  and  $\pi$  described by the citizen’s problem has a negative slope while that given by the government’s problem has a positive slope, there exists a unique cut-off  $\delta_1^*$ .

PROPOSITION I: We are interested in finding whether there exist parameters such that our proposed equilibrium is satisfied, where for a given history  $h_1$  the government’s decision to experiment, imitate or choose a corrupt policy is a function of  $(\Delta, \delta)$ . For expositional convenience, we reproduce the payoffs to government in follower cohort  $(z_f, \delta_f)$  from imitating ( $V_f^{imit}$ ), experimenting ( $V_f^{xpmt}$ ) or choosing a corrupt policy ( $V_f^{corr}$ ), (see also Figure 1)

$$V_f^k = \begin{cases} -\theta\Delta_{fL}^2 + \pi_f^I [r] & \text{if } a_f \in \mathcal{A}_L^h \text{ (i)} \\ -\theta\sigma_\eta^2 + \pi_f^X [r] & \text{if } a_j \in \mathcal{A}^h \text{ (ii)} \\ -\theta\delta_{fc}^2 + \pi_f^C[(\phi - 1)R + r] & \text{if } a_i \in \mathcal{A}^c \text{ (iii)} \end{cases}$$

The opportunity cost of the government’s choice of a corrupt policy is increasing in  $\delta$ . Therefore, in our proposed equilibrium, the probability that an observed policy (conditional on no imitation) is corrupt, is decreasing in  $\delta$ . The set of all possible period one histories  $\mathcal{H}_1$  are divided three ways - the set of period one histories where (a) there is a sole “successful” leader ( $n_L = 1$ ), i.e.  $y_1 > \bar{y} = -\theta\delta_L^2 - R > y_j, \forall j \neq 1$ , (b) there are two or more “successful” leaders, i.e  $n_L \geq 2$ , (c) there are no “successful” leaders, i.e.  $n_L = 0$ . In what follows we focus on (a) and sketch out (b) and (c).

We now begin by mapping  $V^{corr}$  and  $V^{xpmt}$  on  $(V, \delta)$  space. Observe that  $\frac{dV^{xpmt}}{d\delta} = r \frac{d\pi^X}{d\delta} < 0$  and that  $\frac{dV^{corr}}{d\delta} = -2\theta\delta + [(\phi - 1)R + r] \frac{d\pi^C}{d\delta} < 0$ . Since the citizen-voter cannot distinguish between a corrupt and an honest policy, we have  $\pi^X = \pi^C = \pi$  - which implies that  $\frac{dV^{xpmt}}{d\delta} < \frac{dV^{corr}}{d\delta}$ . In order to ensure that both the downward sloping curves intersect in the relevant range on  $(V, \delta)$  space (recollect that  $\delta$  is bounded between  $\delta_L$  and  $\delta_H$ ), we assume  $(\phi - 1)R > \theta(\delta_L^2 - \sigma_\eta^2)$ . This ensures conditions on the end-points of (i) - (iii) such that:  $V^{xpmt}(\delta = \delta_L) = r - \theta\sigma_\eta^2 < V^{corr}(\delta = \delta_L) = -\theta\delta^2 + r + (\phi - 1)R < V^{imit} = r$ . Given the continuity of the payoffs and the restrictions on the end-points that we have imposed, we have an intersection between the curves  $V^{corr}$  and  $V^{xpmt}$  in the relevant  $(V, \delta)$  space - where we denote the point of intersection  $(\hat{\Delta}, \hat{\delta})$ . Further, notice that  $V^{imit}$  ((i) above) is independent of  $\delta$  and hence can be depicted as a horizontal line. Therefore we are now in a position to graph (i) - (iii) on  $(V, \delta)$  space - as illustrated in Figure 1.

We are interested in obtaining the optimal policy choice for a government at  $z_f$  as a function of  $(\Delta, \delta)$ . This is simple to obtain by mapping for each  $\delta \in [\delta_L, \delta_H]$  the policy  $a^j$  corresponding to the  $V^j$  that constitutes the upper envelope of the payoffs, i.e. for any  $\delta$ ,  $a_j^* = \operatorname{argmax}_{a_j} \{V_f^j(a_j) : a_j \in \{\mathcal{A}^c, \mathcal{A}^h, \mathcal{A}_L^h\}\}$  (see further below for a caveat). Keeping this in mind, observe that the payoff from imitation decreases as  $\Delta_{fL}$  increases i.e.  $dV^{imit}/d\Delta_{fL} = -2\theta\Delta_{fL} < 0$ . A “successful” leader’s “neighbors” are defined as the set of countries whose effective distance is sufficiently small such that they would prefer to imitate quite irrespective of the payoff from alternative policy choices for all  $\delta$ , i.e.  $-\theta\Delta_{fL}^2 \geq -\theta\delta^2 + (\phi - 1)R + r$ . This simplifies to a distance  $\Delta_{fL}^2 \leq \Delta_1^2 = \delta_L^2 - \frac{1}{\theta}[(\phi - 1)R + r]$ . Therefore, all such “neighbors” of the leader imitate its policy. On the other extreme consider the cut-off for the “far-periphery”. First, observe from Figure 1 that if distance from the leader is such that  $V^{imit} \leq V^{xpmt}(\delta = \delta_H)$  (i.e. if  $-\theta\Delta_{fL}^2 + r = -\theta\sigma_\eta^2$ ), we either have  $V^{corr} > V^{xpmt} > V^{imit}$  for  $\delta < \hat{\delta}$  or we have  $V^{xpmt} > V^{corr} > V^{imit}$  for  $\delta \geq \hat{\delta}$ . Given the continuity of the payoffs over the relevant space, this establishes the existence of a cut-off distance  $\underline{\Delta}_{fL}$ , such that for all  $\delta \in [\delta_L, \delta_H]$ , governments located beyond this cut-off no longer imitate - giving us the “far-periphery”. Countries that lie at some “intermediate” distance between the “neighbors” and the “far-periphery” (as defined above), constitute the “near-periphery”. As can be readily observed from Figure 1, countries located in this region, may choose (as a function of their  $\delta$ ) imitation, experimentation or corruption as their policy choices. We next check the optimality of the citizen-voter’s re-election rule. Here the citizen compares the realized cost of replacing the incumbent  $c_i$ , with the expected gain in rents if the policy adopted by the government is corrupt. Given the uniform distribution for  $c$ , the re-election probability  $\pi$  is continuous. This is because the citizen’s payoff  $u_i$  is decreasing continuously in the probability that the policy is corrupt since  $\pi = \operatorname{prob}(c_i \geq \psi_2 R)$ . For instance, if  $a_f \in \mathcal{A}_L^h$ , then from Bayes’ rule the

citizen-voter knows for sure that the policy is honest - and hence  $\psi \rightarrow 0 \Rightarrow \pi^I = 1$ . Furthermore since the voter observes the location of the government's policy choice  $a_j$ , he can make an assessment of the likelihood of whether the policy is corrupt or honest. In particular, if a government who's distance from the leader is  $\hat{\Delta}$  (the  $\Delta$  corresponding to  $\hat{\delta}$  in figure 1), chooses to not imitate, it will be perceived by the voter to have chosen a corrupt policy with probability one. This in turn will imply that  $\pi \rightarrow 0$  (since  $\bar{c} \leq R$ ). Therefore, for a relatively 'small'  $\Delta_{fL}$ , we have  $V^{corr} > V^{imit}$  since  $-\theta\delta^2 \geq -\theta\Delta_{fL}^2 + r$ . In contrast, when  $\Delta_{fL}$  is sufficiently 'large' the inequality will reverse itself.

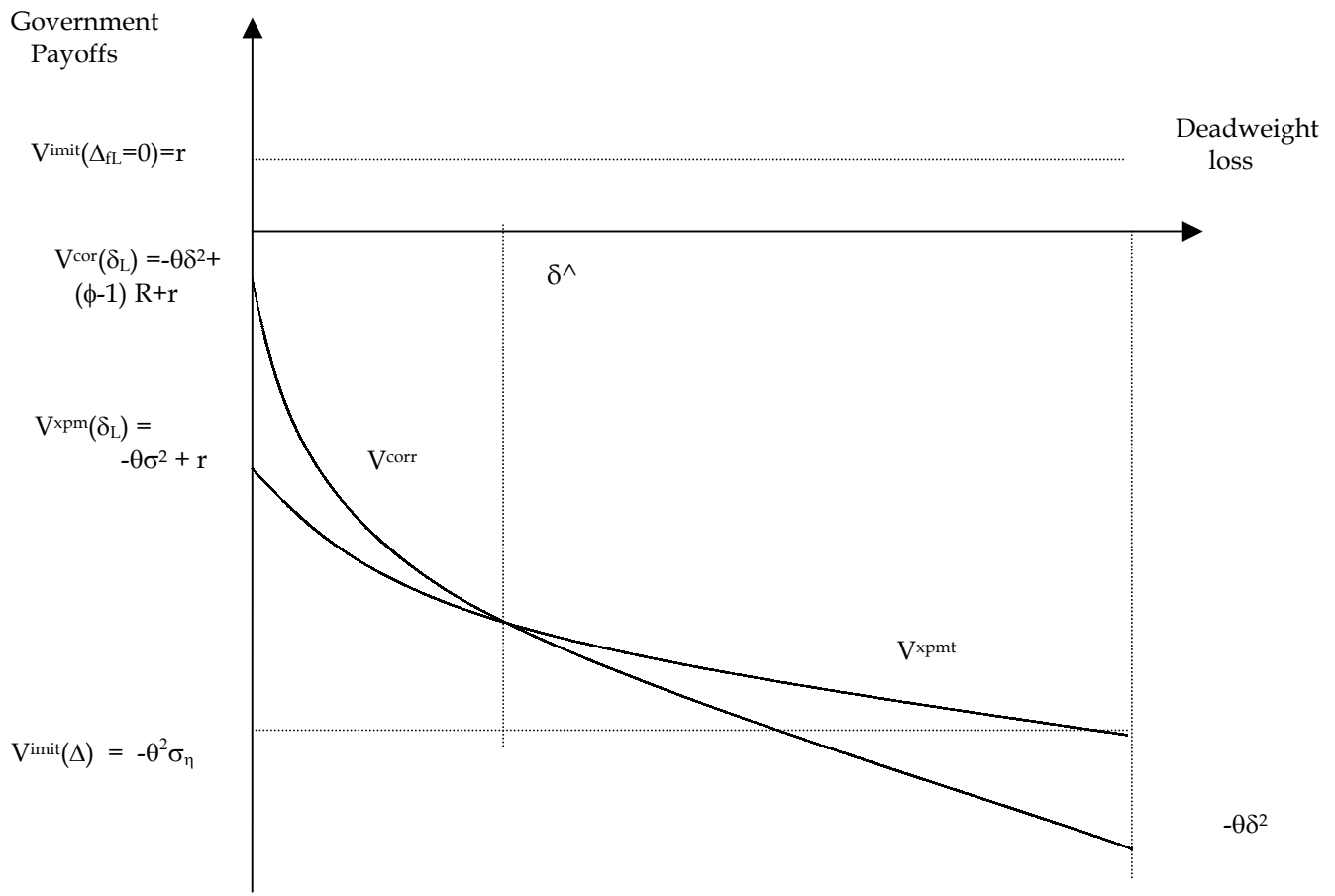
Now we sketch out alternative histories with two or more "successful" leaders, i.e.  $n_L > 1$ . Without loss of generality, suppose there are two leaders  $z_{L_1}$  and  $z_{L_2}$ . There are two possible sub-cases. First, is the possibility that none of the countries in the follower cohort lies simultaneously within a distance  $\underline{\Delta}_{fL}$  of both the leaders  $z_{L_i}$ . In this case, the preceding analysis carries over and  $z_f$ 's decision problem is as if there is a single leader. However, we note that  $\bar{\Delta}_{fL}(n_L = 2) > \bar{\Delta}_{fL}(n_L = 1)$  since higher  $\delta$  countries are more likely to imitate, thereby lowering the average  $\delta$  (and hence  $\pi$ ) of those who do not imitate. In diagrammatic terms, this is equivalent to a downward shift of the  $V^{corr}, V^{xpmt}$  curves - increasing  $\bar{\Delta}_{fL}$ . Observe that for any  $F(z)$ , we can always choose a  $\theta$  large enough so as to ensure that this downward shift of the  $V^{corr}$  and  $V^{xpmt}$  is not so large so as to make imitation the dominant strategy for all countries in  $F(z)$ . Second, is the possibility that  $z_f$  lies between and within a distance  $\bar{\Delta}_{fL}$  of two or more countries  $z_{L_1}$  and  $z_{L_2}$ , i.e.  $|z_{L_1} - z_{L_2}| < 2\bar{\Delta}_{fL}$ . In this case, a follower country's payoff is maximized by imitating the leader with whom it has the least "effective" distance and there is no experimentation by any of the countries located between these two "successful" leaders. Finally, if no "successful" leaders emerged in the leader cohort, then decision making in the follower cohort is identical to that in the leader cohort.

PROPOSITION II: In what follows we begin by considering the history  $h_1$ , with  $n_L = 1$ . Efficient discipline implies that imitation of a leader enhances private sector national income, either by reducing the costs of corruption or the cost of experimentation. Therefore, for disciplining to be efficient for any country  $z_f(\delta, \Delta)$ , it is the case that  $V_f^{imit} \geq V_f^{corr}$ . The latter is true when,  $-\theta\Delta_{fL}^2 + \pi_f^I \geq -\theta\delta_{fc}^2 + \pi_f^C[(\phi - 1)R + r] \Leftrightarrow \Delta_{fL}^2 \leq \{(\delta^2 - \frac{1}{\theta}(\pi^C[(\phi - 1)R + r] + r))\}^2$ . Now recollect that efficient imitation occurs when  $\Delta_{fL} \leq \sigma_\eta$ , where  $\sigma_\eta < \delta_L$ . Therefore, for the informational externality to cause efficient disciplining, the following two conditions must be met: (a) there exists a non-empty set of countries which are disciplined into imitating a leader for political reasons, but would not do so otherwise, and (b) for a subset of these countries, private-sector income increases due to the reduced corruption that results because of greater disciplining. Now for (a) to hold, parameters must be such that  $V^{imit} > V^{corr}$  i.e. if  $\delta^2 + \frac{1}{\theta}\{r(1 - \pi^C) - \pi^C(\phi - 1)R\} \geq \Delta_{fL}^2$ . On the other hand, for (b) to

hold, parameters must be such that  $-\theta\Delta_{fL}^2 > -\theta\delta^2 - R$ . It is easy to check that both (a) and (b) are satisfied for a sufficiently low bound on  $\delta_L$  and  $r$ .

We now demonstrate that there exist parameters in the “near-periphery”, that display “inefficient disciplining”. There are two possibilities: (a) countries that would otherwise have preferred to experiment with an honest policy (i.e. those with high  $\delta$ ) are inefficiently disciplined into imitating a leader primarily for political reasons; (b) countries that would have chosen corrupt policies, are disciplined into adopting honest policies, but the loss in imitating a policy of a distant country is greater than the gain due to a reduction in corruption. First, we describe parameters such that (a) is satisfied: i.e.  $V^{imit} \geq V^{xpmt}$  iff  $\sigma_\eta^2 + \frac{r}{\theta}(\pi^I - \pi^X) \geq \Delta_{fL}^2$ . Since  $\pi^I = 1$  and  $\pi^X < 1$ , we have inefficient imitation for a large enough  $r$  (recollect that  $\Delta^{eff} < \sigma_\eta$ ). (b) Now consider the possibility of inefficient disciplining of corrupt governments. For this to be true, distance  $\Delta_{fL}$  has to be such that  $V^{imit} \geq V^{corr}$ , even though  $-\theta\Delta_{fL}^2 < -\theta\delta^2 - R$ . To see that parameters exist that satisfy these conditions, observe that  $V^{imit} \geq V^{corr} \Leftrightarrow \delta^2 + \frac{1}{\theta}[r(\pi^I - \pi^C) - \pi^C(\phi - 1)R] \geq \Delta_{fL}^2$ . Imposing the above condition implies that a sufficient condition is if  $\delta^2 + \frac{1}{\theta}[r(\pi^I - \pi^C) - \pi^C(\phi - 1)R] \geq \Delta_{fL}^2 > \delta^2 + \frac{R}{\theta}$ . Simplifying we obtain the following  $r(\pi^I - \pi^C) > R(1 + p_C(\phi - 1))$  where  $\pi^I = 1$  and  $\pi^C < 1$ . It is easy to check that this is true for ego rents that are sufficiently large - a restriction consistent with others in the paper.

In order to show that expected income in the “near-periphery” is lower than in the “far-periphery”, examine Figure 1. From the preceding paragraph, there is inefficient imitation if  $V^{imit} > V^{xpmt}$ , even though such imitation results in a decrease in private national income as compared to experimenting, i.e. even though  $-\theta\Delta^2 < -\theta\sigma_\eta^2$ . Recollect that imitation is for political reasons (i.e.  $r$ ) when a government imitates despite the effective distance  $\Delta_{fL}$  being greater than  $\Delta^{eff} = \sigma_\eta$ . Now suppose that such a government lies at some  $\tilde{\Delta} > \Delta^{eff}$ . Observe that for any country located at such a  $\tilde{\Delta}$ , political considerations ensure that the country inefficiently imitates, i.e.  $V^{imit}(\tilde{\Delta}) > V^{xpmt}(\tilde{\Delta})$ . Then there is inefficient imitation by all countries with  $\delta \in [\tilde{\delta}, \delta_H]$ . Observe that all countries with  $\delta$  in this range but with  $\Delta_{fL} > \underline{\Delta}_{fL}$  will witness an increase in income as all governments in this region prefer to experiment. Since  $\Delta_{fL}^2 > \sigma_\eta^2$  for countries in this region, private national income from experimentation is greater than imitation. This implies a higher expected income for countries in this region. Finally, it is easy to check that for countries in the “far-periphery”, none of the countries are disciplined into enacting honest policies. Those with a high  $\delta$ , such that  $V^{xpmt} > V^{corr}$ , would have chosen honest policies in any case. However, since experimentation is being carried out in this region, some countries will achieve a very high income, while others will do poorly, where the variance in incomes is given by  $\sigma_\eta^2$ .



**Figure 1: Equilibrium Policy Choices of the Incumbent**