

NBER WORKING PAPER SERIES

Promises, Promises: Credible Policy Reform  
via Signaling

Dani Rodrik

Working Paper No. 2600

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138

I have benefited from conversations with Thomas Schelling, Sweder van Wijnbergen, and Richard Zeckhauser, and from the comments of Avinash Dixit on an earlier draft. Comments from seminar participants at Michigan, Board of Governors of the Federal Reserve System, and Princeton led to substantial improvements. The research supported here is part of the NBER's research program in International Studies. Any opinions expressed here are those of the authors and not those of the National Bureau of Economic Research.

NBER Working Paper #2600  
May 1988

Promises, Promises: Credible Policy Reform via Signaling

ABSTRACT

Empirical experience and theory both suggest that policy reforms can be aborted or reversed if they lack sufficient credibility. One reason for such credibility problems is the legitimate doubt regarding how serious the government really is about the reform process. This paper considers a framework in which the private sector is unable to distinguish between a genuinely reformist government and its nemesis, a government which simply feigns interest in reform because it is a precondition for foreign assistance. The general conclusion is that the rate at which reforms are introduced may serve to convey the government's future intentions, and hence act as a signal of its "type". More specifically, credible policy reform may require going overboard: the government will have to go much farther than it would have chosen to in the absence of the credibility problem.

Dani Rodrik  
Kennedy School of Government  
Harvard University  
Cambridge, MA 02138

## PROMISES, PROMISES: CREDIBLE POLICY REFORM VIA SIGNALING

Dani Rodrik

### I. Introduction

A government initiates a series of important reforms, including trade and financial liberalization and disinflation policies. But the private sector (and possibly foreign creditors) do not fully believe that the reforms will persist. Should the government attempt to enhance its credibility? How can it do so? What are the consequences for the economy and the reform process if it is unable to?

Experience and theory both suggest that lack of credibility can be very costly indeed. For an important example, consider orthodox policies of disinflation that rely on sharp reductions in monetary growth. Unless the private sector remains fully convinced that the monetary contraction will continue, the result may well be wages and prices set at too high a level relative to the future stock of monetary aggregates. The consequent reduction in real liquidity will then exert strong recessionary forces. A conceptually similar outcome obtains in the case of trade-liberalizing reforms lacking credibility. When a future reversal of the liberalization is anticipated, the private sector will tend to over-borrow from abroad, running "too large" a deficit on the current account (Calvo, 1986; see also van Wijnbergen, 1985). In both cases, the adverse consequences of the lack of credibility could be serious enough to force even the best-intentioned government to abort the reform process, thereby validating the suspicions of the private sector.

More generally, as Calvo (1986) has pointed out, lack of credibility is functionally equivalent to a distortion in the structure of intertemporal relative prices: economic agents base their actions on prices which differ

from those that will materialize if the reform is carried out to fruition. The presence of this distortion in turn creates a second-best environment, with all the usual second-best complications. Hence the reform itself, while beneficial on its own, may lead to losses in overall welfare if perceived as lacking sufficient credibility. Similarly, there may be a second-best role for introducing additional distortions in the economy to the extent that these either offset the distortions associated with the problem or enhance the government's credibility.

Determining the appropriate policy stance in such a context requires knowledge of the sources of the credibility gap. The question is: why would the public fear that the policy reforms will be reversed despite the government's assurances to the contrary? Answers to this question based on rational behavior fall under three broad categories.<sup>1</sup>

First, the government's reforms may be inconsistent with other policies being pursued simultaneously, and be recognized as such by the public. Examples of such situations abound. Trade reform in the presence of pegged exchange rates (with prices sticky downwards) will not be viable, as the Chilean case has demonstrated. Similarly, disinflationary policies which do not concurrently tackle the public-sector budget deficit will lack credibility, irrespective of whether orthodox or heterodox measures are utilized. The establishment of "target zones" for major currencies will not

---

1. Calvo (1986, pp. 27-29) suggests an additional explanation not considered here, namely that policy announcements can never be as complete as the complications of the economy dictate, and hence must almost always suffer from an inherent lack of credibility. I exclude this consideration here because it seems to me to be of second-order importance compared to the others to be discussed.

be a solution to exchange-rate volatility unless the governments concerned undertake the requisite monetary-fiscal policy combinations to maintain their exchange rates within the appropriate bands. In all these cases, policy reform does not pass the credibility test because the public understands that it violates budget constraints or accounting identities.

Secondly, there might be a genuine time-inconsistency problem for the government: its optimal ex-post strategy may differ from its optimal ex-ante strategy. For example, once the private sector sets wages and prices, the authorities may find it tempting to disinflate less than they had promised in order to get some output gains (Barro and Gordon, 1983). Similar temptations to "surprise" the private sector may exist with trade policy as well (see Staiger and Tabellini, 1987). In circumstances where the authorities have an ex-post incentive to renege on their promises, it is of course perfectly rational for private agents to discount announcements of future policy reforms--or assurances of the continuation of present reforms. Potential solutions to the time-inconsistency problem can be found in commitments and reputation-building, neither of which, however, will do the job costlessly. Commitments have the disadvantage of tying the government's hands against unforeseen contingencies in which freedom of action would have been desirable ex ante (see Rodrik and Zeckhauser, 1987). Reputations can be built only by using up valuable time.

The final source of credibility problems is incomplete or asymmetric information: private agents may not be able to tell how serious the government really is about the reform process. In other words, they may be in the dark about the true objectives of the government in power, or may "confuse" it with an alternative government whose objectives differ. Imperfect information of

this sort is likely to be particularly prevalent in countries where governments (and finance ministers) rotate rapidly, and in developing countries in particular. Notice that this is radically different from the time-inconsistency case above where the private sector understands the government's motivations only too well. The resolution of the credibility problem in such instances will require the government to "signal" its true type. Whether this is good policy or not will in turn depend on the cost of investing in the appropriate signal.

The present paper is concerned with this last type of credibility problem. The framework I will consider is one in which the private sector is unable to distinguish between a government intent on trade reform and one which simply feigns interest in reform because this is a precondition for direly needed foreign aid. The general message that will come across is that the rate at which the reform is introduced may serve to convey the government's future intentions, and hence act as a signal of its "type". More specifically, credible policy reform will require going overboard: the government will have to go much further than it would have chosen to in the absence of the credibility problem. In the case considered here, the reform-minded government will buy credibility by not only eliminating protection, but actually subsidizing imports (exports). This provides a solution to the credibility problem in that the reformist government's nemesis would never find it advantageous to go as far. Signaling in this fashion is of course costly, and its ultimate desirability will depend on a number of factors. But, and this is the key point, achieving credibility will always require a larger policy reform than would have been dictated in the absence of the credibility problem.<sup>2</sup>

The model to be analyzed below contrasts the behavior of a "liberalizing" government with that of a "redistributive" government. The former values trade reform because of the usual allocative efficiency gains to derived therefrom, and intends to stick with the liberalization. The latter uses tariff revenues to redistribute income to favored groups in society, and, due to the absence of alternative policies, prefers some protection to none. I assume, as is usually the case, that trade liberalization is supported by foreign assistance from multilateral institutions, with the aid conditional on the launching of the reform. This is a crucial part of the story. Since foreign assistance may well provide a motive for the "redistributive" government to mimic the "liberalizer" for a while, the public cannot be entirely sure in the initial stages of the reform as to which sort of government it faces. Consequently, governmental assurances that the reform will not be reversed in the future are taken with a reasonable grain of salt. Notice that foreign aid results in a hidden cost: by skewing the incentives of the "redistributive" government, it makes it more difficult for the "liberalizing" government to reveal its true type.

The outline of the paper is as follows. Section II lays out the basic

---

2. This conclusion is consistent with the apparent empirical regularity that trade reforms are more likely to be successful when they are undertaken wholesale and in such a way as to create a major break with the past. A recent review of 37 liberalization episodes in 19 countries concludes that "the likelihood of survival of a liberalization attempt is substantially higher where the initial policy measures undertaken are major and significant: halting or hesitating policy actions leading to a very gradual liberalization are much more likely to cause a collapse. This is particularly true in instances of countries (characteristic of most of Latin America) in which the history restrictions on trade is long and pervasive" (Papageorgiou, Michaely and Choksi, 1986). The authors conjecture that this might be partly due to reasons having to do with credibility.

model and discusses the costs engendered by the lack of credibility. In our case, the costs are reflected in sub-optimal levels of investment, as private savings fall in anticipation of higher prices for imported goods in the future. In section III, the sources of the credibility problem are examined by introducing a "redistributive" government with an objective function that differs from that of the "liberalizer". Section IV analyzes the circumstances under which "separating" and "pooling" equilibria will occur, and discusses the likely benefits (and costs) of achieving credibility for the "liberalizing" government via signaling that leads to "separation". Concluding observations are offered in section V.

## II. The Costs of Lack of Credibility

We start with a stylized model of an economy that allows a relatively straightforward analysis of credibility issues. To focus on the new issues, we will abstract from many real-world aspects. In particular, the assumption will be that the domestic economy produces a single good which is not consumed at home, and that all consumption and investment goods are imported. To incorporate the dynamic considerations raised above, we will look at a two-period model. Since trade reform will typically take place under conditions of either capital-account restrictions or credit rationing abroad, capital flows will be assumed to be non-existent save for the possibility of foreign aid. The domestic economy is taken to be small in world markets, and all world prices will be fixed at unity by an appropriate choice of units.

Let  $f(k, \ell)$  and  $F(k+i, \ell)$  be the production functions for domestic output in the first and second period, respectively, and  $i$  be first-period investment. (Given the two-period horizon, there will be no investment in the

second period.) The economy's fixed and fully-employed initial endowments of capital and labor are denoted by  $k$  and  $\ell$ . The level of investment in the economy is determined by maximizing the present discounted value of net benefits of investment:

$$\max_i (\delta F(k+i, \ell) - i),$$

where  $\delta$  is the domestic discount factor (one over one plus the nominal interest rate). I will assume throughout that imports of investment goods are not subject to tariffs, so that the domestic and world prices of investment goods are identical and fixed at unity. Notice that since all producer prices are fixed (and independent of tariffs), changes in  $\delta$  will correspond directly to changes in the real interest rate relevant to investment decisions.

Solving the above maximization problem yields

$$(1) \quad \delta F_1(k+i, \ell) - 1 = 0,$$

where the numbered subscript denotes a partial derivative with respect to the relevant variable. This defines an implicit investment function of the form  $i = i(\delta)$ , with

$$di/d\delta = i'(\cdot) = -F_1/(\delta F_{11}) > 0,$$

since the production function is concave in  $k$ . Desired investment rises as the discount factor increases (or the interest rate falls) since future gains in output become more valued relative to present consumption.

Consumers are represented by a two-period expenditure function  $E(1+t, \delta(1+T), W)$ , where  $W$  denotes welfare, and  $t$  and  $T$  denote first- and second-

period tariffs, respectively. This function gives the present discounted value of expenditures required to achieve welfare level  $W$  when first- and second-period prices are  $1+t$  and  $1+T$ . Notice that the second-period price is discounted by  $\delta$ , and that the real discount factor for consumers is given by

$$q = \delta(1+T)/(1+t).$$

The consumption rate of interest is in turn a negative function of  $q$ , and can be expressed as  $([1/q] - 1)$ . This intertemporal relative price will play a crucial role throughout the analysis, as it is the chief determinant of savings behavior.

The levels of consumption in the two periods can be derived by taking the appropriate partial derivatives of the expenditure function:

$$(2) \quad c = E_1(\cdot) \quad (\text{first-period consumption}),$$

$$(3) \quad C = E_2(\cdot) \quad (\text{second-period consumption}).$$

Since all consumption goods are imported, a tariff is here equivalent to an economy-wide consumption tax. And since tariff revenue will be redistributed in lump-sum fashion back to the private sector, tariffs will not give rise to their usual static efficiency costs in the present framework. As the costs of protection are well known, little harm is done in abstracting from them in order to concentrate on intertemporal sources of welfare losses arising purely from credibility problems. Of course, in the absence of static efficiency costs, the "liberalizing" government would have formally no reason to remove protection. Keeping such costs in the background, we will assume that it will want to pursue trade reform nonetheless.

Equilibrium in the economy requires intertemporal equality between

aggregate income (net of investment spending) and consumption expenditures:

$$(4) E(.) = Y,$$

where Y represents the present discounted value of net income:

$$(5) Y = f(k, l) - i + tc + B + \delta [F(k+i, l) + TC].$$

First-period income consists of production revenues net of investment expenditures plus tariff revenue plus a foreign transfer of amount B which is contingent on first-period trade reform. Notice that foreign assistance is taken to come in the form of a grant rather than a loan (i.e. it is not paid back); this is to simplify the algebra only and will not affect the qualitative results. Second-period income in turn consists of second-period production and tariff revenues.

Since foreign borrowing/lending is ruled out, equilibrium also requires equality between income and expenditure in each period separately. Given (4), one of these two conditions is redundant, and we choose to express the first-period constraint only:

$$(6) (1+t)c = f(k, l) - i + tc + B.$$

This equates first-period domestic savings to investment expenditures.

Equations (4) and (6) together will determine the welfare level W and the discount factor  $\delta$  (or the interest rate).

Now consider a trade reform. The government reduces  $t$  to zero and promises that in the second period  $T$  will be zero as well. This clears the way for foreign aid. But suppose that the public does not believe that the reform will be maintained. The underlying determinants of this lack of

credibility will be discussed later. For the moment, assume that consumers are risk-neutral, and that they act in the certainty that the future level of tariffs will be given by  $\bar{\tau} > 0$ . We will first treat  $\bar{\tau}$  parametrically, and then endogenize it in the sections to come.

What are the consequences of the lack of credibility? The anticipation that tariffs will increase in the future reduces the real consumption rate of interest (raises the real consumption discount factor), and hence depresses first-period savings. In response, investment has to fall, and welfare is reduced due to a sub-optimal level of investment.

To see these effect at work, we analyze the comparative statics of the model (with  $t=0$ ). Differentiating (4) and (6) and making the appropriate substitutions, we first express the response of the real discount factor ( $q$ ) to changes in  $\bar{\tau}$ :

$$(7) \quad 0 < dq/d\bar{\tau} = (\delta/[1+\phi]) < \delta,$$

where

$$\phi = ([1+\bar{\tau}]/i') \{-\delta E_{22}(1 + \bar{\tau}(\delta E_{2W}/[E_{1W} + \delta E_{2W}]))\} > 0.$$

The various cross-derivatives of the expenditure function are signed as follows:  $E_{22}$  is non-positive due to the negative semi-definiteness of the substitution matrix, and  $E_{1W}$  and  $E_{2W}$  are positive under the assumption that present and future goods are both "normal" with positive income elasticities of demand. Notice that  $q$  increases with  $\bar{\tau}$ , but that the effect is dampened due to a reduction in  $\delta$ . (In the absence of changes in  $\delta$ ,  $dq/d\bar{\tau}$  would have equalled  $\delta$ .) That is,  $\delta = \delta(\bar{\tau})$  with  $d\delta/d\bar{\tau} < 0$ . The welfare level, in turn, is directly related to the consumption rate of interest:

$$(8) \quad dW = (1/\theta)\delta\bar{T}E_{22} \, dq,$$

where  $\theta = (E_W - \delta\bar{T}E_{2W}) > 0$  (see Dixit and Norman, 1980, p. 187). Hence

$$(9) \quad dW/d\bar{T} = (\delta^2/\theta[1+\phi])\bar{T}E_{22} \leq 0.$$

This expression is unambiguously negative whenever evaluated at an initially positive level of  $\bar{T}$ . But when the credibility problem is "small", the associated welfare losses are of second order of importance. An explicit expression for the welfare losses associated with the lack of credibility can be found via a first-order Taylor approximation.<sup>3</sup> Letting  $\Delta W = W(\bar{T}) - W(0)$  represent the difference between the welfare levels resulting under imperfect and full credibility, respectively:

$$(10) \quad \Delta W \approx (\delta^2/\theta[1+\phi])E_{22}\bar{T}^2 < 0.$$

Notice that the cost is proportional to the square of the anticipated tariff, and is larger the stronger is intertemporal substitutability in consumption (represented by  $E_{22}$ ).<sup>4</sup>

The welfare costs of imperfect credibility arise from the intertemporal distortion introduced by anticipations of future tariffs. The consumption rate of interest is reduced artificially, resulting in sub-optimal levels of saving and investment in the economy. In the present framework, consumers and

---

3. I.e.,  $W(0) \approx W(\bar{T}) + (dW/dT)[0 - \bar{T}]$ , where  $dW/dT$  is evaluated at  $\bar{T}$ .

4. We could also think of (10) as an approximation using the mean value theorem, in which case all the derivatives on the right-hand side have to be evaluated at an intermediate point between 0 and  $\bar{T}$ .

producers make all of their decisions in the first period; the second period's consumption level is entirely determined by previous investment and saving decisions. Consequently, no changes in consumption or investment behavior are possible when the government's true intentions are revealed in the second period. The economy suffers from an anticipated but unrealized reversal in the trade reform in exactly the same way that it would from an actual reversal.<sup>5</sup> Lack of credibility is functionally equivalent to unsuccessful reform.

Notice in addition that no time-inconsistency problems arise for the "liberalizing" government. Once the second period comes around, the government's best strategy remains to follow its original promise of zero tariffs, irrespective of the anticipations harbored by the public.

For later reference, it will also be useful to perform the comparative statics of the system with respect to changes in the foreign transfer, B. Differentiating (4) and (6) once again (with  $t=0$ ), we are left with:

$$\begin{bmatrix} \theta & -\delta TE_{22} \\ E_{1W} & (E_{12} + di/d\delta) \end{bmatrix} \begin{bmatrix} dW \\ d\delta \end{bmatrix} = \begin{bmatrix} dB \\ dB \end{bmatrix}$$

The determinant (Det) can be shown to be positive, so we have (after simplifying by using the homogeneity properties of E(.)):

$$dW/dB = (1/Det)[(di/d\delta) - \delta E_{22}] > 0, \text{ and}$$

---

5. In a richer model, the private sector would normally have the ability to adjust some of its behavior once the expectations upon which it acted is proved wrong. This would then drive a wedge between the ex-ante and ex-post levels of welfare. For an interesting analysis of such issues in a different context see Persson and Svensson (1983). See also below.

$$d\delta/dB = (1/\text{Det})\delta E_{2W} > 0.$$

Notice that an increase in the transfer raises the discount factor and therefore stimulates investment. The effect comes about as the increase in first-period income leads to a less than equal increase in desired first-period consumption.

### III. The "Redistributive" Government

The discussion above has taken for granted the existence of a credibility problem for the government (as in Calvo, 1986, and Froot, n.d.). In order to partially endogenize credibility it is convenient to conceptualize the problem as arising from an inability on the part of the public to identify the true motives of the government in power. Why should the new regime's promises be any more credible than the previous regime's? The development process is littered with half-hearted reforms, and the public eventually learns: plus ca change, plus c'est la meme chose. Absent significant signs to the contrary, the public will generally be safe in discounting promises of lasting reform.

This sort of situation can be modelled by assuming that the private sector maximizes its expected utility given its prior beliefs regarding the likelihood that the reform will be aborted. Let  $T^R$  denote the value of the tariff that will obtain if the reform is reversed, and  $\pi$  be the prior probability attached to the reform being maintained. The expected value of the second-period tariff, denoted  $\exp(T)$ , can be written as follows:

$$\exp(T) = \pi \cdot 0 + (1-\pi) \cdot T^R.$$

When the public is unable to tell the "type" of the government in place,  $\pi$  will be generally indeterminate and will depend on history and other characteristics of society; I will therefore treat it as exogenously given. In a "separating" equilibrium, on the other hand,  $\pi$  will be known to be either zero or unity. In this sense,  $\pi$  is a direct measure of the credibility of reform.

We define the "certainty-equivalent" level of the second-period tariff as that level which, if known with certainty, would make consumers behave in exactly the same fashion as in the expected utility maximization described above. Denoting the certainty-equivalent level of the second-period tariff by  $\bar{T}$ , we can show that  $\bar{T}$  and  $\exp(T)$  are related in the following manner:

$$(11) \quad \bar{T} = \exp(T) + \delta\xi\pi(1-\pi)[T^R]^2,$$

where  $\xi$  is a composite term involving first- and second-order derivatives of the indirect utility function, and has an indeterminate sign (see Appendix). Since the second term involves the square of the second-period tariff, it is of second-order importance compared to the first term.<sup>6</sup> In what follows, I will generally ignore it. Notice that, as expected,  $\bar{T}$  is linked positively to  $T^R$  and negatively to  $\pi$ .

Completing the model now requires description of the behavior of alternative governments that would find it profitable to abort the reform process. The list here is endless. I confine myself to a case which is

---

6. The certainty-equivalent tariff is close, but not identical, to the expected value of the second-period tariff, even though consumers are assumed to be risk-averse in income. This follows from the fact that the indirect utility function is not linear in prices.

fairly general in its applicability. Consider a government whose objectives are primarily distributional: to redistribute income to a favored group in society from a less-favored group.<sup>7</sup> Suppose further that tariffs are the sole means of raising revenue for this purpose. Then, this "redistributive" government will attempt to achieve its distributional aim at least cost to overall efficiency. Letting superscripts denote the two groups in society, we could visualize its objective function as being the following:

$$\text{Max}_{\tau, T} W^1 \quad \text{s.t.} \quad W^2 \geq \bar{W},$$

$$\text{where} \quad W^1 = V(1+\tau, \delta(1+T), Y^1+Q),$$

$$W^2 = V(1+\tau, \delta(1+T), Y^2-Q),$$

$$Y^i = \gamma^i Y, \quad i=1,2, \quad \gamma^1 + \gamma^2 = 1,$$

$$Q = \tau c^2 + \delta TC^2.$$

$V(\cdot)$  denotes an indirect utility function, and  $\gamma^i$  is the share of each of the two groups in total income before redistribution. We will treat individuals in the two groups as being identical in all respects but their label, and will assume that intertemporal demand functions are homothetic. This way, aggregate behavior--aggregate levels of consumption and the discount rate--will be independent of income distribution.

The "redistributive" government strives to maximize the welfare of the first group subject to a minimum welfare level for group 2. It does so by

---

7. This is somewhat reminiscent of the framework considered by Alesina (1987) in which the existence of two political parties with different trade-offs between inflation and unemployment is shown to generate a business cycle that accompanies the political cycle.

redistributing all tariff revenue to the former group; hence group 1 receives in lump-sum fashion the tariff payments made by group 2 ( $Q$ ) to supplement its income. The higher the level of tariff revenues, the more redistribution this government can undertake. The tariffs that solve the above problem will be denoted by  $t^R$  and  $T^R$ . Notice that as long as the constraint  $W^2 \geq \bar{W}$  continues to bind, no time-inconsistency problems arise, since once  $t$  is chosen the only way of guaranteeing  $\bar{W}$  to the second group is by selecting the level of  $T$  which is optimal ex ante. But when the constraint does not bind, the pre-commitment and time-consistent policy paths may diverge (see the next section).<sup>8</sup>

Consider first the case where foreign assistance is non-existent ( $B=0$ ). Then, provided that the constraint  $W^1 \geq \bar{W}$  is not binding at  $t=T=0$ , the "redistributive" government will choose to have positive levels of protection so as to benefit group 1. What will be the optimal levels of the tariffs? Given its objective function, the "redistributive" government has the incentive to transfer income from one group to the other at least cost in terms of efficiency. This can be achieved by setting the tariff rates in the two periods equal to each other, i.e.  $t^R=T^R$ . This allows the economy to remain intertemporally efficient. Denote the common level of the tariff as  $\bar{t}$ . Since  $\bar{t}$  keeps group 2 just at  $\bar{W}$ , it must be the case that

$$E(1+\bar{t}, \delta^*(1+\bar{t}), \bar{W}) = (1+\bar{t})E(1, \delta^*, \bar{W})$$

---

8. In this case, the maximization problem of the redistributive government has to be stated differently, involving a two-stage decision: first maximize over  $T$ , given  $t$ ; secondly, choose  $t$  given second-period decision rule linking  $T$  to  $t$ .

$$= \gamma^2 \{ f(\cdot) - i^* + \delta^* F(k+i^*, \cdot) \},$$

where the starred variables are fixed at the levels that obtain in the absence of intertemporal distortions (i.e. when  $t=T$ ). This allows us to derive an explicit expression for the "optimal" tariff:

$$(12) \quad \bar{t} = (\gamma^2 \{ f(\cdot) - i^* + \delta^* F(k+i^*, \cdot) \} + E(1, \delta^*, \bar{w})) - 1.$$

We could think of this as the pre-existing level of the tariff before the reformist government takes over.

So far, the "redistributive" government and the "liberalizer" would necessarily reveal themselves by their choice of trade policies in the initial period: the first settles on  $t=\bar{t}$ , the second on  $t=0$ . In practice, there will occasionally be reasons for the "redistributive" government to act out of character. In the context of developing countries, this will be typically the case when balance-of-payments difficulties force the government to seek the "green light" from multilateral organizations such as the IMF or the World Bank. Obtaining the requisite foreign assistance will then require a number of reforms which the government will undertake to appease its foreign creditors, but will not particularly feel committed to maintaining. Indeed, once the foreign-exchange constraint is alleviated, back-tracking will be the natural temptation.<sup>9</sup>

---

9. Witness the recent case of Zambia, which is described in the colorful prose of The Economist as follows: "Now Mr Kaunda has told the IMF to get lost. He wants to service no debts, get no new loans and have no new policies. Instead he is imposing on his people a new, tighter version of the bad old policies that led to the trouble in the first place, and whose only-bogus-merit is that they are not imposed by foreign bankers" (May 9, 1987, p. 13).

In the present framework, the foreign transfer B serves to highlight the problem. I assume that the transfer is contingent on trade reform being carried out in the first period, with tariffs lowered to zero. In the second period, no additional transfers are made, and the government can freely choose its policies.<sup>10</sup> Will the "redistributive" government reduce tariffs in the first period? If B is large enough, it clearly will. Setting  $t=0$  has the cost of preventing income redistribution in the first period. But this cost can be more than offset by the relaxation of the overall budget constraint as a consequence of the foreign transfer. In fact, the transfer may also allow the "redistributive" government to impose a higher tariff in the second period than it would otherwise have been able to. The latter follows from the fact that the relaxation of the overall budget constraint allows the second group to be squeezed to a greater extent than before. The next section provides more detail on these issues.

#### IV. Pooling and Separating Equilibria

I will first consider the characteristics of pooling and separating equilibria, and then use these to discuss how the government can successfully signal its type and distinguish itself from the "redistributive" government.

Pooling equilibrium. Consider a pooling equilibrium wherein the two

---

10. The question arises: why would foreign lenders not extract commitments for longer-term reform? The general answer is that they would like to but can't. Once the domestic crisis is abated, the need for multilateral aid is reduced and conditionality becomes inoperative. This points to an important dilemma: the governments that are the most deserving of assistance from the perspective of the multilateral institutions are the ones that could be hurt by it due to the induced credibility problems.

types of government both set first-period tariffs equal to zero, and hence become indistinguishable. For this to be an equilibrium, the "redistributive" government has to find it preferable to forsake redistributive policies in the first period. Let the maximum-value function associated with this government's optimization problem be written as  $W^1(t^R, T^R)$ . In the absence of pooling,  $t^R$  will be non-zero, and foreign assistance will not be forthcoming. Then  $t^R = T^R - \bar{c}$  as discussed above. In a pooling equilibrium, by contrast, the "redistributive" government is constrained to set  $t^R=0$ , but can choose  $T^R$  otherwise optimally. As will be shown below, this optimal level of  $T^R$  will depend, among others, on  $B$  and  $\pi$ ; let it be written as  $T^R = T^R(B, \pi)$ . Pooling is an equilibrium when the following inequality holds:

$$(13) \quad W^1(0, T^R(B, \pi); B>0) \geq W^1(\bar{c}, \bar{c}; B=0).$$

It ought to be clear that  $W^1(0, T^R(B, \pi))$  is an increasing function of  $B$ : as the amount of foreign aid increases, the intertemporal budget constraint is relaxed, and the potential welfare of both groups in society rises. Hence the larger is  $B$ , the greater the likelihood that a pooling equilibrium will result. The borderline level of  $B$ , denoted by  $B^{\min}$ , is defined implicitly by the relation  $W^1(0, T^R(B^{\min}, \pi); B=B^{\min}) = W^1(\bar{c}, \bar{c}; B=0)$ .

Let us suppose that the level of  $B$  indeed exceeds  $B^{\min}$ , so that the economy is stuck in a pooling equilibrium. We can now characterize this equilibrium more fully. We already know that  $t=0$ , and that  $\bar{T}$  is linked to  $T^R$  via expression (11). To determine  $T^R$  in turn, we have to bear in mind that the ex-ante and ex-post levels of second-period consumption (and hence of

---

welfare) will differ for each group. That is because first-period decisions are based on  $\bar{T}$ , whereas the actual outturn will be either 0 or  $T^R$ . This affects the actual redistribution to take place in the second period, and drives a wedge between the ex-ante and ex-post levels of welfare for each group.

Consider the situation from the perspective of the second group. Let  $\delta(\bar{T}, B)$  be the function linking the discount factor to the (certainty-equivalent) second-period tariff rate and the foreign transfer (see section II). Distinguishing anticipated from actual outcomes by using "-" with the former, and letting superscripts distinguish the two groups, we first have:

$$(14) \quad E(1, \delta(\cdot)(1+\bar{T}), \bar{W}^2) = \gamma^2 \{ f(\cdot) - i(\delta(\cdot)) + B + \delta(\cdot)F(k+i(\delta(\cdot), \cdot)) \}$$

This ensures that planned expenditures are consistent with the present discounted value of resources available to the second group. However, if in the second period the government in power reveals itself as the redistributive type,  $T$  is set at  $T^R > \bar{T}$ , and this group's real income and consumption fall. To represent the situation, define a restricted expenditure function  $\bar{E}(\cdot)$  which yields the minimum expenditure level required to reach a given level of welfare when first-period consumption ( $c^2$ ) is pre-determined:

$$(15) \quad \bar{E}(1+T^R, W^2; c^2) = \min_{c^2} \{ (1+T^R)c^2 \text{ s.t. } U(c^2, C^2) \geq W^2 \},$$

where:

$$(16) \quad c^2 = E_1(1, \delta(\cdot)(1+\bar{T}), \bar{W}^2).$$

Then, second-period equilibrium requires

$$(17) \quad \bar{E}(1+T^R, W^2; c^2) = \gamma^2 F(k+i(\delta(\cdot)), \cdot),$$

i.e. that consumption expenditures be in line with the higher-than-anticipated second-period tariff. Given  $T^R$ , equations (14), (16), and (17) jointly determine first-period consumption ( $c^2$ ), ex-ante welfare ( $\bar{W}^2$ ), and ex-post welfare ( $W^2$ ) for the second group. An analogous set of equations can be written also for the first group.

Notice that a time consistent path of policy would require that the constraint  $W^2 \geq \bar{W}$  be binding for the "redistributive" government in equilibrium. This is because the second group can always be squeezed to the limit in the second period--once all savings and investment decisions have been made--without incurring any efficiency costs. Hence, the equations above can be used to solve for the optimal choice of  $T^R$ . To do so, we fix  $W^2$  at  $\bar{W}$ , and let the three equations determine  $T^R$ ,  $c^2$ , and  $\bar{W}^2$ . This defines an implicit function  $T^R = T^R(B, \pi)$ .

Of particular interest is the nature of the linkage between  $B$  and  $T^R$  in such a pooling equilibrium. While the algebra here gets messy, the basic story is clear. An increase in  $B$  raises real income in the economy both through its direct effect and through the induced increase in investment (the latter being at a sub-optimal level given  $T^R > 0$ ). That in turn stimulates first-period consumption, and makes room for a greater squeeze of the less-favored group through a larger tariff in the second period. Hence a larger amount of foreign aid will result in a greater intertemporal distortion.

Foreign assistance therefore has two important hidden costs in terms of the credibility of the reform process. First and foremost, it makes a pooling equilibrium more likely, and increases the probability that a genuinely

reform-minded government will be confused with one whose motives are ambiguous. Secondly, by relaxing the economy-wide budget constraint, it permits a larger redistributive role for a government so inclined, and a more generous application of distorting policies to that end.

Notice, however, that the "redistributive" government pictured here also cares about efficiency. This sets a natural limit to how far it would like to pursue an intertemporal wedge. In particular, it is possible that for sufficiently high levels of  $T^R$ , further increases in  $B$  will be welfare-reducing for this government, as the added costs of the intertemporal distortion (since  $T^R$  is increasing in  $B$ ) may be severe enough. In such a case, it would prefer to allow the constraint on  $W^2$  not to bind. But this would require an ability to pre-commit to a level of the second-period tariff which is lower than that required by time consistency. Short of such pre-commitments, the redistributive government will always be tempted to tax the second group to the maximum extent, as there are no efficiency costs of doing so once the second period starts.

Separating equilibrium. Let us now turn to separating equilibria. In such equilibria the "liberalizing" government will not face a credibility problem. It is clear from the above discussion that this will be the case whenever  $B < B^{\min}$ . The more interesting questions arise when  $B \geq B^{\min}$ , yet the "liberalizing" government can successfully signal its type in order to achieve separation. How can it do so, and will it want to?

In general, governments will have a multitude of signals available to them. But the better signals are the ones that can communicate the desired message most directly. In the present framework, the most direct signal of the government's future intentions is the first-period tariff itself. The

appropriate signal can be communicated by implementing a negative tariff, or an import subsidy. (A positive tariff would clearly not do the job since it makes the "redistributive" government only keener to imitate.) Such a signal conveys important information to the public since an import subsidy increases the cost to the "redistributive" government of mimicking the "liberalizer". And the "liberalizing" government can profitably send such a signal, even though the subsidy policy is going to be costly to it too.

To see these points, it is useful to determine first the costs of an import subsidy to the "redistributive" government. Based on this, we can then argue that with a sufficiently large first-period subsidy, pooling will no longer remain an equilibrium. Finally, we can check to see whether this signaling strategy is a profitable one for the "liberalizing" government.

To start with, consider the effect of a first-period subsidy on the "redistributive" government's welfare. The subsidy makes the relative price of second-period consumption even higher, i.e. it reduces the consumption rate of interest further. In addition, with the subsidy in place, the resources available to the government for redistributive purposes will be lower: some of the second-period tariff revenue now goes to subsidize the first-period consumption of the less-favored group, and cannot be used to transfer income to the favored group. To offset this, the government may want to raise  $T^R$  further, but at the margin the cost of doing this has increased as well: the subsidy exacerbates the intertemporal distortion, and on this account makes a lower  $T^R$  preferable. Hence the "redistributive" government is caught in a bind, which will be reflected in a lower level of welfare for the favored group.

Notice that the ex-ante and ex-post levels of welfare will move in the

same direction in response to the imposition of a first-period subsidy. This is because the amount by which the ex-post and ex-ante redistributions differ is unaffected. We can therefore safely confine the analysis to ex-ante welfare. In analogous fashion to equation (14), the anticipated level of welfare for the first group ( $\bar{W}^1$ ) can be implicitly defined by the following expression:

$$(18) \quad E(1-s, \delta(1+\bar{T}), \bar{W}^1) \\ = \gamma^1 \{f(\cdot) - i(\delta) + B + \delta F(k+i(\delta), \cdot)\} + [-sc + \delta TC],$$

where  $s$  is the rate of subsidy and  $\delta$  is once again a function of the exogenous variables. This makes clear that first-period subsidy payments subtract directly from the income transfer made available to the first group. To see the effects of  $s$  on  $\bar{W}^1$ , we can differentiate this expression while holding  $T^R$  (and hence  $\bar{T}$ ) constant.

$$(19) \quad E_{\bar{W}^1} d\bar{W}^1 = -c^2 ds + [\bar{T}C^2 d\delta - sdc^2 + \delta \bar{T}dC^2] + [-sdc^1 + \delta \bar{T}dC^1].$$

Notice that, since only relative prices matter, changes in  $s$  and  $\bar{T}$  have qualitatively similar effects on endogenous variables. Therefore an increase in  $s$  reduces the consumption rate of interest and lowers  $\delta$ , as we already know from section II that  $dq/d\bar{T} > 0$  and  $d\delta/d\bar{T} < 0$ . Without further algebra, then, the effects on  $\bar{W}^1$  can be easily deduced.

The first term of (19) captures the direct effect of  $s$  on the income transfer to the first group, and is negative. The terms in the first bracket are the distributional effects induced by intertemporal substitution. These amount to a loss for the first group as well since: (a) the subsidy re-allocates the second group's consumption from the second period (in which it

is taxed) to the first period (in which it is subsidized), and hence narrows the base for the income transfer between the groups; and (b)  $\delta$  falls (as  $d\delta/ds < 0$ ) thereby reducing the present discounted value of the redistribution. Finally, the terms in the second bracket capture the share of the first group in the overall efficiency losses borne by the economy as a consequence of the exacerbation of the intertemporal distortion.

Hence the first-period subsidy has both distributional and efficiency costs for the "redistributive" government. Notice that adjusting  $T^R$  will not make the problem go away entirely, since while this can reduce the intertemporal distortion it can never make up for the income transfer lost through the subsidy. Effectively, the subsidy worsens the trade-off between efficiency and distribution for this government. Its value as a signal of the reformist government's intentions resides precisely in this fact.

The fact that the first-period subsidy increases the cost to the "redistributive" government of imitating the "liberalizer" implies that pooling will no longer be an equilibrium for a sufficiently high level of  $s$ . Denote by  $s^*$  the minimum level of the subsidy needed to achieve separation. This level is implicitly defined by the following equality:

$$(20) \quad W^1(-s^*, T^R(s^*, B, \pi); B > 0) - W^1(\bar{t}, \bar{t}; B = 0).$$

where  $W^1(\cdot)$  is once again the maximum-value function for the "redistributive" government. Past a certain level  $s^*$ , this government will prefer to give up the foreign aid  $B$  and will revert to its separating strategy of imposing a uniform tariff  $\bar{t}$  in both periods.

When will the "liberalizing" government signal? The question now becomes whether the "liberalizing" government will find it in its interest to separate

via signaling in this fashion. The answer has to be ambiguous in general since signaling is costly: it imposes efficiency costs on this government as well. In the present framework, such costs could be avoided in principle by subsidizing imports in the second period also. This way, the intertemporal distortions induced by the first-period subsidy could be eliminated (or, more generally, reduced). But the problem with this strategy is that it is time-inconsistent. Once the second period comes around, the "liberalizing" government will no longer have the incentive to implement the subsidy, as it generally prefers to avoid trade distortions, and the private sector will have already irrevocably allocated its consumption intertemporally. This in turn implies that the "promise" of a second-period subsidy will not be credible, and hence will not yield the desired pattern of intertemporal substitution.

Given that the "liberalizer" cannot avoid the costs of signaling, how far will it be able to go? Notice that the marginal efficiency cost of the first-period subsidy is lower for this government than it is for the redistributive government, provided separation is achieved. The reason is simple. Once the signal is communicated, the expected second-period tariff falls to zero, and the welfare cost of the first-period subsidy is therefore lowered. In effect, a "small" enough subsidy, which is successful in separating the two governments, will lead to only second-order welfare losses to the reformist government. Since the reduction in the intertemporal distortion achieved by credibility is a source of first-order welfare gain, the balance will be in favor of signaling whenever  $s^*$  is small enough. In other words, credible reform will have a bias towards overshooting its target.

More can be said. To the reformist government, the cost incurred by lack of credibility is proportional to the distortion in the consumption rate of

interest caused by it (see section II). A credible signal via the subsidy creates an equivalent distortion in the consumption rate of interest in the same direction. Now the government will clearly pursue the second strategy provided it is the lesser of the two evils.<sup>11</sup> Denote by  $s^{\max}$  the rate of the subsidy that causes a level of distortion identical to any given  $\bar{T}(B, \pi)$ . This level is defined implicitly by

$$(21) \quad \delta/(1-s^{\max}) = \delta[1+\bar{T}(B, \pi)].$$

This expression equates the consumption rate of interest resulting from a first-period subsidy (and no credibility problem) with that emerging in a pooling equilibrium (with no subsidy). Or:

$$(22) \quad s^{\max} = \bar{T}(\cdot)/[1 + \bar{T}(\cdot)].$$

This tells us the maximum rate of subsidization the "liberalizing" government is willing to undertake, provided separation is thereby achieved. (Notice that the subsidy has been defined throughout in specific rather than ad-valorem terms. In the latter case,  $s^{\max}$  would be defined simply by  $s^{\max} = \bar{T}(\cdot)$ .)

Whether the signal will be employed and a separating equilibrium will result can now be easily determined. The answer depends on the relationship between  $s^*$  and  $s^{\max}$ . As long as  $s^{\max} > s^*$ , it will pay to signal, and the

---

11. This abstracts from additional problems that can be created by the subsidy. Typically, governments will be revenue-constrained in the sense that additional taxes can be collected only at high cost. This will make the "liberalizing" government look more like the "redistributive" one: it will make the former more hesitant to employ policies which lead to reductions in available revenue.

reformist government will select  $s = s^*$ . When  $s^{\max} < s^*$ , effective signaling will be too costly, and the government will resign itself to living with the credibility problem and choose  $s = 0$ .<sup>12</sup> In the unlikely case that  $s^{\max} = s^*$ , the government will be indifferent between the two strategies.

Finally, consider whether the "liberalizing" government would be willing to ask its foreign creditors to curtail their assistance so as to reduce the incentive of the "redistributive" government to mimic. Provided  $s^*$  is small enough, this will not be a profitable strategy since the income losses due to reductions in  $B$  will be first-order and large relative to the costs of increasing  $s$ . But with large  $s^*$  (i.e. costly signaling) there will exist a tradeoff at the margin between  $B$  and  $s$ .

#### V. Concluding Remarks

The purpose of this paper was to make precise an intuition that is commonly shared: the credibility of policy reform is intimately linked to the pace at which it is introduced and carried out. The argument offered here is that policy overshooting may have the consequence of distinguishing a genuinely reform-minded government from its more equivocal counterparts. That in turn has the effect of rendering the reform process more credible than it would otherwise have been, alleviating many problems introduced by the credibility gap. To be sure, the speed of reform is not the only signal that will generally be available to policy-makers.<sup>13</sup> But such a signal has the

---

12. In this case, the intertemporal distortion could be severe enough for the government to be willing to forsake  $B$  and set  $t > 0$ .

13. In a recent paper, for example, Persson and van Wijnbergen (1987) examine

advantage that its message is carried within the policy itself, and hence is relatively easily decoded by its recipients. Other, less direct signals will often require that the public disentangle complicated general-equilibrium relationships.

While many of the conclusions drawn in the preceding sections are specific to the model analyzed, the basic argument is a robust one. At the outset of any reform, the public will typically be unable to fathom the true motivations of the government undertaking the reform. Since the distorting policies in question have been put in place by those in power to begin with, what reason is there to believe that the authorities now "see the light"? The confusion becomes worse when, as is often the case, the policy freedom of the government is temporarily restricted as a consequence of a crisis whose resolution requires the cooperation of actors in favor of reform. In the present model, such a situation was created by the availability of foreign assistance contingent on trade reform. But clearly such instances are more general. For lack of alternatives, a temporary crisis will frequently require incoherent and ill-intentioned policy-makers to act (temporarily) just like coherent and well-intentioned ones. Signaling via policy-overshooting can then help reduce the confusion.

With respect to trade reform proper, the conclusions of the present paper run against much conventional wisdom regarding the advantages of gradualism. While I have not considered any of the usual justifications for gradualism,<sup>14</sup>

---

the possibility that wage-price controls may act as a signal of a disinflationary government's intentions.

14. For arguments in favor of gradualism, see Edwards and van Wijnbergen

the credibility argument made here serves to qualify the usual arguments made in that context. In practice, the nature of the tradeoff between these possibly conflicting considerations will depend on the importance of the credibility gap. The more severe are the credibility problem and its consequences, the more likely it is that a sharp break with the past will be viewed as attractive.

---

(1986) and Rodrik (1987).

APPENDIX

This appendix derives the certainty-equivalent tariff expressed in equation (11). Let  $p$  and  $P$  denote the prices for the two periods.  $\hat{P}$  is the second-period price--a random variable under our assumptions.  $\bar{P}$  is its certainty-equivalent. The general problem is to find the level of  $\bar{P}$  that is implicitly defined by the following expression:

$$(A1) \quad V(p, \bar{P}, I) = EV(p, \hat{P}, I),$$

where  $V(\cdot)$  and  $EV(\cdot)$  stand for the indirect utility function and its expected value, and  $I$  is income. Notice that income is non-random, as it is completely determined once first-period choices are made. If consumers are risk-neutral in income, we can write

$$(A2) \quad V(p, P, I) = v(p, P)I,$$

hence (A1) becomes:

$$(A1') \quad v(p, \bar{P}) = EV(p, \hat{P}).$$

Now we approximate both sides of the equality by a second-order Taylor expansion around  $(p, \bar{P})$ , where  $\bar{P}$  denotes the expected value (average) of the second-period price.

$$v(p, \hat{P}) = v(p, \bar{P}) + v_2(\hat{P} - \bar{P}) + \frac{1}{2}(v_{12} + v_{22})(\hat{P} - \bar{P})^2,$$

Therefore,

$$(A3) \quad E v(p, \hat{P}) = v(p, \bar{P}) + \frac{1}{2}(v_{12} + v_{22})\sigma^2,$$

where  $\sigma^2$  is the variance of the second-period price. Notice that all partial derivatives of  $v(\cdot)$  are evaluated at  $(p, \bar{P})$ . In turn,

$$(A4) \quad v(p, \hat{P}) = v(p, \bar{P}) + v_2(\hat{P} - \bar{P}) + \frac{1}{2}(v_{12} + v_{22})(\hat{P} - \bar{P})^2.$$

The last term can be ignored here as it will be of the order  $\sigma^4$ . Setting (A3) and (A4) equal to each other, we can solve for  $\hat{P}$ :

$$(A5) \quad \hat{P} = \bar{P} + (1/2v_2)(v_{12} + v_{22})\sigma^2.$$

Since  $\sigma^2 = \text{var}(\hat{P}) = \text{exp}(\hat{P}^2) - [\text{exp}(\hat{P})]^2$ , it is straightforward to show that

$$(A6) \quad \sigma^2 = \pi(1-\pi)[\delta T^R]^2.$$

Denoting  $\xi = (1/2v_2)(v_{12} + v_{22})$  and substituting (A6) into (A5) yields equation (11) in the text.

While  $\xi$  cannot be signed in general, the interested reader can verify that (when  $\bar{P} > p$ ) a sufficient condition for  $\xi$  to be negative is for consumers to prefer price stabilization to price variability, i.e. for  $v(\cdot)$  to be concave.

REFERENCES

- Alesina, Alberto, 1987, "Macroeconomic Policy in a Two-Party System as a Repeated Game," Quarterly Journal of Economics CII(3), 651-678.
- Barro, Robert J., and David B. Gordon, 1983, "A Positive Theory of Monetary Policy in a Natural Rate Model," Journal of Political Economy 91(4), 589-610.
- Calvo, Guillermo, 1986, "Incredible Reforms," unpublished paper, University of Pennsylvania, September.
- Froot, Kenneth, n.d., "Credibility, Real Interest Rates, and the Optimal Speed of Trade Liberalization," unpublished paper, Sloan School, MIT.
- Papageorgiou, Demetris, Michael Michaely, and Armeane Choksi, 1986, "The Phasing of A Trade Liberalization Policy: Preliminary Evidence," CPD Discussion Paper No. 1986-42, World Bank, December.
- Persson, Torsten, and Lars E.O. Svensson, 1983, "Is Optimism Good in A Keynesian Economy?" Economica 50, 291-300.
- Persson, Torsten, and Sweder van Wijnbergen, 1987, "Signaling, Wage Controls and Monetary Disinflation Policy," unpublished paper, September.
- Rodrik, Dani, 1987, "Trade and Capital-Account Liberalization in a Keynesian Economy," Journal of International Economics 23, 113-129.
- Rodrik, Dani, and Richard Zeckhauser, 1988, "The Dilemma of Government Responsiveness," Journal of Policy Analysis and Management 7, forthcoming.
- Staiger, Robert, and Guido Tabellini, 1987, "Discretionary Trade Policy and Excessive Protection," unpublished manuscript, January.
- van Wijnbergen, Sweder, 1985, "Trade Reform, Aggregate Investment and Capital Flight: On Credibility and the Value of Information," Economics Letters 19, 369-72.