Why Do Reforms Occur in Crises Times?

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Abstract

Structural reforms, whereby organized groups lose their power to extract rents, tend to occur in bad times rather than during prosperous times. We present a model where rent-seeking leads to economic decline, which, in turn, will make a future reform inevitable when times will be bad enough. Furthermore, we show that in the case of trade liberalization—a prime example of structural reform—there is strong empirical evidence that reforms are induced by severe crises.

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1. Introduction

Structural reforms, whereby organized groups lose their power to extract rents, tend to occur in bad times rather than during prosperous times. This pattern is puzzling at first. Why aren't countries more prone to reform in good times when they can better afford the adjustment costs, including the compensation of losers? But history shows that reforms face, in prosperous times, a staunch opposition, which only breaks-down amid conflict during times of economic demise, either following a long period of economic decline or in the wake of a severe crisis. Evidence of crisis-lead reforms abound: Southern Europe in the wake of the Eurozone crisis; the trade reforms of Latin America in the 1980s and 90s; the French Revolution.

In this paper, we present a model where rent-seeking leads to economic decline, which, in turn, will make a future reform inevitable when times will be bad enough. Furthermore, we show that in the case of trade liberalization—a prime example of structural reform—there is strong empirical evidence that reforms are induced by severe crises.

Regulations such as trade protection, labor market protection, or state monopolies create opportunities for various groups to appropriate resources from the rest of the economy. While optimal from the point of view of each group, such pattern of appropriation may nevertheless precipitate the decline of the aggregate stock of available resources and reduce the opportunity for appropriations in the future. As rents shrink over time, the temptation arises for each powerful group to implement a structural reform in order to destroy the power of the other groups and seize new opportunities in the new regime. Since triggering a reform entails costs for a group, in terms of forgone rents, such move only occurs when economic conditions are so deteriorated that protection-related rents have become very low. In this equilibrium, there is a death-foretold scenario in which groups, despite knowing reform will eventually occur, overappropriate anyhow.

The dynamics described above are modeled through the combination of a dynamic appropriation game and a preemption game. We characterize two types of non-cooperative equilibria. In reform equilibria, groups' rent-seeking decisions drive down the stock of aggregate resources up to the point where conflict is inevitable. Structural reform is the outcome of such conflict. There are also no-reform equilibria in which groups moderate their rent seeking, aggregate resources do not decline and reform never occurs.

Our empirical analysis focuses on trade liberalization, as a prime example of deep struc-

tural reform. We use the trade reform index of Sachs and Warner (1995), updated by Wacziarg and Welsh (2008), and construct a de facto index of the onset of severe crises. We find that over the period 1970-2005, the probability of observing a reform in the wake of a severe economic crisis is about two to three times higher than in tranquil times. For example, the probability of observing a crisis the very same year of a trade liberalization is 23 percent vs. 9.7 percent of observing a crisis during a no-reform year. This yields an odds ratio of 2.8. With a 5-year window, the probability of observing a crisis either the year of the reform or 4 years before is 71% vs. 32% in any window of the same length, but without a reform (the odds ratio is 5.1). This evidence is confirmed by a series of conditional logit regressions which show that the odds of a trade reform is between two and three times higher following a severe crisis. These estimates are statistically significant at the 1% level across different time windows and remain robust when controlling for political reforms, as well as reforms and crises in neighboring countries.

The rest of the paper is organized as follows. In Section 2., the model is introduced, and its main predictions are derived. Section 3. presents the empirical analysis. Section 4. presents a literature review and Section 5. concludes.

2. Model

There are two powerful groups with power to extract resources from the rest of the economy. Both group have "common access" to the stock of available resources, and so they both face the following accumulation equation

$$\dot{k}_t = \beta k_t - g_{1,t} - g_{2,t}, \qquad k(0) = k_0, \tag{1}$$

where β is the raw growth rate of available resources and $g_{i,t}$ is the appropriation of group i.[1] Each group can freely choose its appropriation up to an upper bound

$$g_{i,t} \in [0, \bar{g}k_t], \qquad 0 < \beta < \bar{g} < \infty. \tag{2}$$

We have set the upper appropriation bound $\bar{g}$ larger than β so that it is not binding in the interior equilibria we characterize below. The stock of available resources can be interpreted in several ways. As the capacity of the rest of the economy to purchase goods from protected monopolistic sectors; as the fraction of the economy that is directly impacted by labor

[1] The analysis can be extended to $n>2$ groups.

market protection; as the stock of potential fiscal resources that state-owned monopolies soft-budget constraints can draw from. According to the context, the $g's$ can be interpreted as monopolistic rents, as wages demanded by unions, as fiscal demands by state-owned companies to cover revenue shortfalls. They can also be interpreted as rents from trade protection, which accrue to firms that are granted import licenses and to firms that are protected from trade competition. In both cases the benefits of protection extend to both capital owners and workers. Labor market protection creates rents not only for protected workers, but also for their employers by de facto increasing the entry cost for new firms. State monopolies, such as railways, operating under soft budget constraints, allow for the operation of non-profitable lines, as well as maintaining high employment and strengthening the power of the unions.

While the term "reform" is essentially vague and can be used to characterize any change in the intensity or the nature of regulation, from mild to drastic, we narrow here the meaning to a deep structural reform.

Definition 1 *Reform is a regime shift whereby one or more powerful groups loose forever their power to appropriate resources from the rest of the economy. Reform occurs when one or both groups undertake a costly action that destroys the power of the other group.*

We will refer to this costly action as "attack"(or "preemption") and denote the date of attack by group i as τ_i. By attacking, we mean that one group breaks the current rent-seeking status quo and undertakes a costly action that ultimately results in the removal of protection. In the case of a protected industry, one can think either of a strike by the unions, or of a locked down by the industrialists.

In choosing whether to attack, the groups move sequentially within each instant: at any time before reform has occurred group 1 decides whether to attack, group 2 observes this action and then decides whether to attack.[2] Once reform occurs the game is over. There are three possible outcomes:

$$\begin{aligned} \tau_i < \tau_j &\quad i \text{ is the leader, } j \text{ is the follower} \\ \tau_i = \tau_j &\quad i \ \& \ j \text{ match} \\ \tau_i > \tau_j &\quad i \text{ is the follower, } j \text{ is the leader} \end{aligned}$$

We denote by τ the reform date

$$\tau = \min\left(\tau_i, \tau_j\right).$$

[2]For a setup where groups need to move simultaneously see Fudenberg and Tirole (1985).

A group's payoff is simply the present value of her appropriations up to the reform date plus the present value of her payoff at reform time

$$\int_0^{\tau} g_{i,t} e^{-\delta t} dt + S_i(k_\tau, \tau_i, \tau_j) e^{-\delta \tau}, \qquad \delta < \beta. \tag{3}$$

We have assumed that the discount factor is lower than the growth rate of available resources to ensure that the group's value functions converge in the no-reform equilibrium.

The payoff to group i at reform time is

$$S_i(k_\tau, \tau_i, \tau_j) = \begin{cases} A - Q(k_\tau) & \text{if } \tau_i < \tau_j \\ A_m - Q_m(k_\tau) & \text{if } \tau_i = \tau_j \\ 0 & \text{if } \tau_i > \tau_j \end{cases} \tag{4}$$

The term $Q(k_\tau)$ (or $Q_m(k_\tau)$) is a one-time cost incurred at the time of the attack. This cost is increasing in the aggregate stock of available resources (the state variable). It can be interpreted as the opportunity cost of going to strike (lost wages); shutting down a plant to get rid of the unions; blocking transportation facilities; organizing the occupation of large agrarian estates, etc. In all cases, the costly disruption triggers a reform, which puts an end the prevailing rent-seeking status quo.[3] The term A (or A_m) denotes the value associated with the benefits of reform for those who have attacked and triggered the reform. One can think of industrialists of a protected industry who through a locked down has simultaneously precipitated a trade reform and the break-up of the power of unions. While such industrialists have lost their rents from trade protection, they have won the ability to turn around their businesses thanks to cheaper inputs and a deregulated environment. Moreover, by destroying the power to extract rents, including their own, they are able to align themselves with the new political regime.[4]

Reforms impose very large costs on protected groups. In the case of trade reform, for example, the massive downsizing of firms previously shielded from competition result in large revenue losses, and often lead to deep social conflicts (strikes, lock-downs). These costs, however, tend to be much higher when the economy is booming, as this is when powerful groups stand to lose {enjoy }large revenues and generous subsidies. Or in the context of our model, when the pool of resources potentially available to the powerful groups is high. To

[3]There is a large literature on general equilibrium models where in addition to production decisions, agents also invest in offense and defense. See for instance Grossman (1991), Skaperdas, etc.

[4]An historical example of such a move is the "Night of August, 4, 1789" in which a group of the aristocrats, members at the French National Assembly, voted the end of their privileges.

capture this effect, we impose the following conditions on the costs of attack

$$\frac{\partial Q(k)}{\partial k} > 0, \qquad \frac{\partial Q_m(k)}{\partial k} > 0. \tag{5}$$

To ensure that reform does not occur at t=0, we set the initial stock of resources k_0 high enough so that at t=0 the payoff of following is greater than that of both becoming the leader and matching. We do so by making the attack costs at t=0 higher than the benefits

$$A - Q(k_0) < 0, \qquad A_m - Q_m(k_0) < 0. \tag{6}$$

If the groups overappropriate and drive k down, the cost of attack will fall over time. When k will reach a low enough level, preemption will become optimal. The question is whether it is an equilibrium for the groups to overappropriate and drive down k in the first place. To address this question we consider a dynamic game where at each point in time, each group makes two decisions: (i) an appropriation policy $\{g_{i,t}\}_{t=s}^{\infty}$ and (ii) a date of attack (τ_i). The solution concept we use is Markov Perfect Equilibrium, i.e., the strategies are only functions of the state:

$$\begin{array}{ll} g_{it}(k_t, g_{jt}^*(k_t), \tau_i^*, \tau_j^*) & \text{appropriation} \\ \tau_i\left(k_t, \tau_j^*\right) & \text{time of attack} \end{array}$$

A. Markov Perfect Equilibria

We solve the accumulation-preemption game in two stages. First, taking as given the attack dates (τ_i, τ_j) we solve the accumulation game and obtain a pair of appropriation policies $\left\{g_{i,t}^*, g_{j,t}^*\right\}$ that are best-responses to each other. Then we solve for the reform date τ. In the first step, we express the problem of group i as a control problem in which group i takes as given the equilibrium strategy of the other group j, as well as the attack dates τ_i and τ_j.

$$\begin{aligned} & \max_{\{g_{i,t}\}, k_\tau} \int_0^\tau g_{i,t} e^{-\delta t} dt + S(k_\tau, \tau_i, \tau_j) e^{-\delta \tau} \\ \text{s.t.} \quad g_{i,t} &\in [0, \bar{g} k_t] \\ \dot{k}_t &= \beta k_t - g_{i,t} - g_{j,t}^*(k_t, \tau_i, \tau_j) \end{aligned} \tag{7}$$

To obtain the solution to the problem of group i, consider the following Hamiltonian

$$H_i = g_{i,t} e^{-\delta t} + \lambda_{it}\left[\beta k_t - g_{i,t} - g_{j,t}^*(k_t)\right] + \bar{\mu}_{it}\left[\bar{g} k_t - g_{it}\right] + \underline{\mu}_{it} g_{it}$$

The first order conditions for group i are:

$$\frac{\partial H_i}{\partial g_i} = e^{-\delta t} - \lambda_{it} - \bar{\mu}_{it} + \underline{\mu}_{it} = 0 \tag{8}$$

$$\dot{\lambda}(t) = -\frac{\partial H_i}{\partial k_t} = -\lambda_{it}\beta + \lambda_{it}\frac{\partial g^*_{j,t}}{\partial k_t} - \bar{\mu}_{it}\bar{g} \tag{9}$$

$$0 = \bar{\mu}_{it}\left[\bar{g}k_t - g_{it}\right], \quad \bar{\mu}_{it} \geq 0 \tag{10}$$

$$0 = \underline{\mu}_{it} g_{it}, \quad \underline{\mu}_{it} \geq 0 \tag{11}$$

In addition, there is a fifth optimality condition, the transversality condition, which varies depending on τ_i and τ_j. Notice that the FOCs are sufficient for an optimum as the second order conditions are satisfied.

An analogous set of optimality conditions apply to group j. A solution to the accumulation game is a pair of policies $\left\{g^*_{i,t}, g^*_{j,t}\right\}$ that satisfies the two sets of FOCs and the two transversality conditions.

There are two types of equilibria: no-reform MPE in which τ_i and τ_j are infinite, and reform MPE. We consider each in turn.

A.1 No-Reform Equilibrium

Surprisingly, even in this minimal setup where groups act non-cooperatively and just care about the present value of their appropriations, there are equilibria where groups do not overappropriate so that k grows over time and so no reform will ever occur. To derive such a no-reform equilibrium suppose for a moment that $\tau = \infty$ and that groups choose interior appropriation policies $g_{it} \in (0, \bar{g}k_t)$ and $g_{jt} \in (0, \bar{g}k_t)$. In this MPE, the transversality condition is

$$\lim_{t\to\infty} \lambda_{it} k_t = 0. \tag{12}$$

The Lagrange multipliers are both zero $\bar{\mu}_{it} = \underline{\mu}_{it} = 0$, so (8) becomes

$$\lambda_{it} = e^{-\delta t} \Rightarrow \frac{\dot{\lambda}_{it}}{\lambda_{it}} = -\delta.$$

Condition (9) becomes

$$\frac{\dot{\lambda}_{it}}{\lambda_{it}} = \frac{\partial g^*_{j,t}}{\partial k_t} - \beta$$

Thus, (8) and (9) for group i hold simultaneously if and only if group j's policy satisfies

$$\frac{\partial g^*_{j,t}}{\partial k_t} = \beta - \delta \tag{13}$$

Consider now the problem of the other group. The FOCs are: $\bar{\mu}_{j,t} = \underline{\mu}_{j,t} = 0$ and

$$\lambda_{j,t} = e^{-\delta t}, \qquad \frac{\dot{\lambda}_{j,t}}{\lambda_{j,t}} = \frac{\partial g^*_{i,t}}{\partial k_t} - \beta. \tag{14}$$

The same argument as above shows that the two conditions for group j in (14) hold if and only if group i's strategy satisfies $\frac{\partial g^*_{i,t}}{\partial k_t} = \beta - \delta$.

In order to derive the equilibrium appropriation policies we integrate $\frac{\partial g^*_{i,t}}{\partial k_t} = \beta - \delta$ and $\frac{\partial g^*_{j,t}}{\partial k_t} = \beta - \delta$, and note that if $k_t = 0$, then $g_{i,t}(0)$ and $g_{j,t}(0)$ must be 0

$$g^*_{i,t}(k_t) = g^*_{j,t}(k_t) = [\beta - \delta]\, k_t$$

Next, we verify that transversality condition (12) is satisfied. Since $g^*_{i,t}(k_t) = g^*_{j,t}(k_t) = [\beta - \delta]\, k_t$, along the equilibrium path the stock of available resources evolves according to $k^*_t = k_0 e^{(2\delta - \beta)t}$. Thus, $\lim_{t\to\infty} e^{-\delta t} k^*_t = \lim_{t\to\infty} k_0 e^{(\delta-\beta)t} = 0$ if and only if $\delta < \beta$.

We have shown that if $\tau = \infty$, there is a unique interior equilibrium of the appropriation game where both groups appropriation is given by (13). To confirm that this pair of appropriation policies indeed generates a no-reform path it is necessary that it generates an increasing path for k^*_t. Since $k^*_t = k_0 e^{(2\delta-\beta)t}$, the no-reform path arises if and only if $2\delta \geq \beta$.

Lemma 2 (No-reform Equilibrium) *There is a no-reform equilibrium if the growth rate of available resources β and the discount rate satisfy*

$$\delta < \beta \leq 2\delta.$$

In this equilibrium, powerful groups choose appropriation policies in the interior of the appropriation set

$$g^*_{i,t}(k_t) = g^*_{j,t}(k_t) = [\beta - \delta]\, k_t$$

The stock of available resources increases over time

$$\frac{\dot{k}^{nr}_t}{k^{nr}_t} = 2\delta - \beta.$$

This result shows that in our minimal setup, there is nothing inherent to generate a fall in available resources and induce reform. There is indeed a range of parameters that allow the regulated economy to sustain growth and in doing so to avoid a reform-triggering crisis. The parametric assumption that allows such equilibrium has a simple interpretation. Productivity should exceed the discount rate so as to make reinvestment of resources in the

pool profitable for each group, but productivity should not be too high either so that both groups, who do not internalize the effect of each other's decision, do not end up choosing a level of private appropriation so high so that, despite high productivity, the pool of resources ends up being depleted over time.[5]

A.2 Reform Equilibria

In these equilibria, groups overappropriate and drive down available resources k_t. Because the cost of attack $Q(k_\tau)$ is increasing in k_τ, there is a unique time when preemption (i.e. attacking) is optimal. Recall that the group running the preemptive attack becomes the leader, the other group the follower, except in the case of a simultaneous attack by both groups (matching).

Denote by $L(\tau)$ the NPV, as of time 0, of leading given that reform will take place at time τ; similarly for the NPV of following $F(\tau)$ and matching $M(\tau)$.

$$L(\tau) = \int_0^\tau g^*_{l,t} e^{-\delta t} dt + [A - Q(k_\tau)] e^{-\delta \tau} \tag{15}$$

$$F(\tau) = \int_0^\tau g^*_{f,t} e^{-\delta t} dt \tag{16}$$

$$M(\tau) = \int_0^\tau g^*_{m,t} e^{-\delta t} dt + [A_m - Q_m(k_\tau)] e^{-\delta \tau} \tag{17}$$

There are two key observations about the reform date (see Fudenberg and Tirole (1985)). First, reform must occur no latter than the time that leading and following generate the same payoffs: $\tau \leq \tau^{lf}$, where τ^{lf} is defined by $L(\tau^{lf}) = F(\tau^{lf})$. At a latter time $L(t) > F(t)$ and so both groups have an incentive to preempt. Second, reform cannot occur before the time that matching and following generate the same payoffs: $\tau \geq \tau^{mf}$, where τ^{mf} is defined by $M(\tau^{mf}) = F(\tau^{mf})$. At earlier times, $M(t) < F(t)$ and so no group will attack even if the other group attacks. For any $t \geq \tau^{mf}$ a group will attack if the other group attacks.

A.3 Leader-Follower Reform Equilibrium

Since there is a mutual dependence between the appropriation policies $g's$ and the reform date τ, the equilibrium is solved as follows. First, we take as given the reform date τ and

[5] This seemingly paradoxical effect of high productivity in common pool problems is described as the voracity effect in Lane and Tornell (1999).

solve for the leader's and the follower's appropriation policies $\left\{g_{i,t}^*, g_{j,t}^*\right\}$. Second, we solve for τ^* by inverting the equation $L(\tau^*) = F(\tau^*)$.

Given the reform date, the FOCs for the leader's problem are (8)-(11) and the transversality condition is

$$\lambda^l(\tau) = \frac{\partial S^{leader}(k_\tau)}{\partial k_\tau} = -\frac{\partial Q(k_\tau)}{\partial k_\tau} e^{-\delta\tau}. \tag{18}$$

The follower's problem has the same FOCs (8)-(11) as the leader, but the transversality condition is

$$\lambda(\tau) = \frac{\partial S^{follower}(k_\tau)}{\partial k_\tau} = 0. \tag{19}$$

In order to characterize the Markov-Perfect Equilibrium (MPE), we consider three appropriation policy sequences: the interior policy on $t \in [0, \tau]$, the maximal appropriation policy on $t \in [0, \tau]$, and the minimal appropriation policy on $t \in [0, \tau]$.

From Lemma 1 we know there is only one possible interior appropriation policy $g_{i,t}^* = [\beta - \delta] k_t$. This policy cannot be part of a leader-follower MPE because such a policy would imply $\lambda_{it} = e^{-\delta t}$, which contradicts transversality condition (18) for any cost function with $\frac{\partial Q(k_\tau)}{\partial k_\tau} > 0$.

Consider next the case where both groups choose the maximal appropriation $\bar{g} k_t$ over $[0, \tau]$. Is this part of an MPE? In this case $\underline{\mu}_{it} = 0$ and so (8) implies

$$\bar{\mu}_{it} = e^{-\delta t} - \lambda_{it} \tag{20}$$

Substituting this condition in (9) we get

$$\dot{\lambda}_i(t) = [2\bar{g} - \beta] \lambda_i(t) - \bar{g} e^{-\delta t}$$

The general solution to this differential equation is

$$\lambda_i(t) = e^{[x-\delta]t} \left[C + \frac{\bar{g}}{x} e^{-xt} \right], \quad \text{where} \quad x \equiv 2\bar{g} - \beta + \delta > 0. \tag{21}$$

The positive sign for x follows from the assumption $\bar{g} > \beta$. The value of the constant C is determined by the transversality condition. In the leader's case, by setting $t = \tau$ in (21) we get $C = -\left[\frac{\partial Q(k_\tau)}{\partial k_\tau} + \frac{\bar{g}}{x} \right] e^{-x\tau}$. Thus, along the equilibrium path the costate variable is

$$\lambda_l^*(t) = e^{[x-\delta]t} \left[-\frac{\partial Q(k_\tau)}{\partial k_\tau} e^{-x\tau} + \frac{\bar{g}}{x} \left[e^{-xt} - e^{-x\tau} \right] \right] \tag{22}$$

Replacing $\lambda_l^*(t)$ back in (20) we get the Lagrange multiplier

$$\begin{aligned} \bar{\mu}_l^*(t) &= e^{-\delta t} \left[1 + \frac{\partial Q(k_\tau)}{\partial k_\tau} e^{x[t-\tau]} - \frac{\bar{g}}{x} \left[1 - e^{x[t-\tau]} \right] \right] \\ &= e^{-\delta t} \left[\left(1 - \frac{\bar{g}}{x} \right) + \left(\frac{\bar{g}}{x} + \frac{\partial Q(k_\tau)}{\partial k_\tau} \right) e^{-x[\tau - t]} \right] \end{aligned} \tag{23}$$

The leader finds it optimal to set $g^*_{l,t} = \bar{g}k_t$ on $[0,\tau]$ provided the Lagrange multiplier $\bar{\mu}_l(t)$ is non-negative on that time interval. Clearly, $\bar{\mu}_l(t)$ is unambiguously positive on $[0,\tau]$ for any attack cost function that is increasing in terminal k because $\frac{\bar{g}}{x} \equiv \frac{\bar{g}}{2\bar{g}-\beta+\delta} \in (0,1)$. Thus, given a reform date $\tau = \tau_l < \tau_f$, it is optimal for the leader to set its appropriation rate at the maximal rate $\bar{g}k_t$ on $[0,\tau]$.

Since in the follower's case $\frac{\partial Q(k_\tau)}{\partial k_\tau} = 0$, the Lagrange multiplier for the follower is

$$\bar{\mu}_f(t) = e^{-\delta t}\left[1 - \frac{\bar{g}}{x}\left[1 - e^{-x[\tau - t]}\right]\right], \tag{24}$$

which is strictly positive for t on $[0,\tau]$ because $\frac{\bar{g}}{x} < 1$. Hence, given a reform date $\tau = \tau_l < \tau_f$, it is optimal for the follower to set its appropriation rate at the maximal rate $\bar{g}k_t$ on $[0,\tau]$.

Next, we show that neither the leader nor the follower find it optimal to set $g_{i,t} = 0$ on $[0,\tau]$ in a leader-follower MPE. In this case $\bar{\mu}_{it} = 0$, and so (8) implies $\underline{\mu}_{i,t} = \lambda_{i,t} - e^{-\delta t}$. The Lagrange multipliers would then be $-\bar{\mu}^*_l(t)$ and $-\bar{\mu}^*_f(t)$, which are strictly negative. Thus, $g_{l,t} = 0$ on $[0,\tau]$ or $g_{f,t} = 0$ on $[0,\tau]$ cannot be part of a leader-follower MPE.

We have shown that from the policies we considered, only the maximal appropriation pair $\{\bar{g}k_t, \bar{g}k_t\}$ can be part of a leader-follower MPE.[6] It follows that the growth rate of the stock of available assets is

$$\frac{\dot{k}^{lf}(t)}{k^{lf}(t)} = \beta - 2\bar{g} < 0. \tag{25}$$

To derive the reform date note that it is necessary that at τ, both groups be indifferent between leading and following: $L(\tau) = F(\tau)$. That is, reform takes place when the Leader's cost of attack equals the benefits it will get over the infinite future. Since the leader and the follower have the same appropriation rates on $[0,\tau]$, it follows from (15) and (16) that the reform date is determined by $A = Q(k_{\tau^*})$. Using the accumulation equation (25) to solve this equation we obtain the equilibrium reform date.

Proposition 3 (Leader-follower Reform Equilibrium) *There is a unique leader-follower equilibrium in which both groups set their appropriation rates at the maximal rate $g^*_{i,t} = \bar{g}k_t$ and drive down the stock of available resources $\frac{\dot{k}^{lf}(t)}{k^{lf}(t)} = \beta - 2\bar{g} < 0$. When available resources reach a critical low level, one group finds it optimal to incur the cost to destroy the power of the other group. This reform date is known with certainty, and it is given by*

$$\tau^*_{fl} = \frac{\log(k_0) - \log(Q^{-1}(A))}{2\bar{g} - \beta} \tag{26}$$

[6] To complete the proof we need to show that equilibria where groups switch back and forth between the three appropriation levels cannot be part of a reform MPE. This is tedious and relegated to the appendix.

We would like to note that one can complicate the setup by letting the benefits of leading A depend on k_τ, but the gist is the same as long as the net benefit of attack $A(k) - Q(k)$ is increasing in k.

A.4 Matching Reform Equilibria

In these equilibria both groups undertake the costly action ($\tau_i = \tau_j = \tau$) and so both lose their power to appropriate resources from the rest of the economy. These equilibria may better describe situations in which powerful groups, by entering into a frontal conflict, do neutralize each other, ending up both being sidelined as reform takes place.

There are multiple matching equilibria indexed by the reform date τ. Recall that initially there are enough resources so that it does not pay to forego rent-seeking and attack even if the other group were to preempt. That is, the value of matching is lower than the value of following ($M(k_0) < F(k_0)$). As long as $M(k_t) < F(k_t)$ reform cannot occur in equilibrium. It is as if, in the non-cooperative environment we consider, both groups implicitly agree on blocking reform and keeping the status-quo. If in equilibrium available resources decline over time, there is a time τ^{mf} defined by $M(\tau^{mf}) = F(\tau^{mf})$. For any $t \geq \tau^{mf}$ a group will attack if the other group attacks. If $\tau^{mf} \leq \tau^{lf}$, a reform of the matching-type can occur at any time on $[\tau^{mf}, \tau^{lf}]$.

We derive matching equilibria using the same procedure as the leader-follower equilibrium. First, suppose that reform will happen at τ. Group i's FOCs are (8)-(11) and the transversality condition is

$$\lambda(\tau) = \frac{\partial S^{matching}(k_\tau)}{\partial k_\tau} = -\frac{\partial Q_m(k_\tau)}{\partial k_\tau} e^{-\delta\tau} \tag{27}$$

The question is whether at least one group will find it optimal to chose the maximal appropriation $\bar{g}k_t$ over $[0, \tau]$ so that k_t falls over time. Recall that in any MPE, appropriation can take only one of three values $g^*_{i,t} = \{0, [\beta - \delta]k_t, \bar{g}k_t\}$, and so if none of the groups chooses $\bar{g}k_t$, then k_t follows an increasing path.

Let's investigate whether $g^*_{i,t} = g^*_{j,t} = \bar{g}k_t$ for all t on $[0, \tau]$ can be part of a matching equilibrium. The FOCs of group i imply that $\underline{\mu}_{it} = 0$, and that λ_{it} and $\bar{\mu}^*_i(t)$ are given by (22) and (23), respectively, replacing $\frac{\partial Q(k_\tau)}{\partial k_\tau}$ by $\frac{\partial Q_m(k_\tau)}{\partial k_\tau}$. As in the leader's case, $\bar{\mu}_i(t)$ is unambiguously positive on $[0, \tau]$ for any attack cost function $Q_m(k_\tau)$ that is increasing in terminal k because $\frac{\bar{g}}{x} \equiv \frac{\bar{g}}{2\bar{g}-\beta+\delta} \in (0, 1)$. Thus, it is individually optimal for each group to

choose maximal appropriation $\bar{g}k_t$ on $[0,\tau]$ even if it knows this will lead to reform at time τ, when both groups will lose their power to extract resources from the rest of the economy.

Proposition 4 (Matching Reform Equilibria) *There are multiple matching equilibria indexed by the reform date τ^m. Each group sets its appropriation rate at the maximal rate $g_t^* = \bar{g}k_t$ and the stock of available resources is driven down $\frac{\dot{k}^m(t)}{k^m(t)} = \beta - 2\bar{g} < 0$. When available resources reach a critical low level, both groups find it optimal to incur the cost to destroy the power of the other group. The reform date τ^m is known with certainty and can take any value on $\left[\tau^{mf}, \tau^{lf}\right]$, where τ^{lf} is given by (26) and τ^{mf} is*

$$\tau^{mf} = \frac{\log(k_0) - \log\left(Q_m^{-1}(A_m)\right)}{2\bar{g} - \beta}. \tag{28}$$

To sum up, a leader-follower equilibrium always exists, while matching equilibria exist if and only if $\tau^{mf} \leq \tau^{lf}$. That is, matching may occur if at the time the value of leading reaches the value of following, matching is preferred to following. If $A_m - Q_m(k_t) \leq A - Q(k_t)$, we have $\tau^{mf} < \tau^{lf}$. In the case $A_m - Q_m(k_t) = \alpha\left[A - Q(k_t)\right]$ with $\alpha < 1$, we have $\tau^{mf} = \tau^{lf}$.

A.5 No-Reform vs. Reform Equilibria

In the no-reform equilibrium, even though groups behave in a voracious way, they do not overappropriate and so available resources do not decline over time. Thus, they can extract resources indefinitely as reform never takes place. In contrast, in a reform equilibrium, there is overappropriation and so reform will occur when declining resources reach a critical low level. In this equilibrium, there is a death-foretold scenario in which groups, despite knowing reform will eventually occur, overappropriate anyhow.

Are powerful groups better-off in the no-reform equilibrium or in reform equilibria? We can answer this question when both type of equilibria exist, which requires that parameters satisfy $\delta < \beta < \min(\bar{g}, 2\delta)$ (recall that if $2\delta < \beta < \bar{g}$, only reform equilibria exist).

We will show that in the case in which the two equilibria exist, both powerful groups are better-off in the no-reform equilibrium than in the leader-follower reform equilibrium. To see this let's compute the value associated with each equilibrium. In the no-reform equilibrium, each group optimal appropriation is $g_t^*(k_t) = [\beta - \delta]\, k_t$ and so the payoff to each group is

$$N^* = \int_0^\infty [\beta - \delta]\, k_t^* e^{-\delta t} dt = \int_0^\infty [\beta - \delta]\, k_0 e^{(2\delta - \beta)t} e^{-\delta t} dt = k_0. \tag{29}$$

In the leader-follower reform equilibria, each group optimal appropriation is the maximal rate $g_t^* = \bar{g}k_t$, and so available resources evolve according to $k_t^* = k_0 e^{(\beta - 2\bar{g})t}$. Replacing this expression in (15) and (16) we get

$$L^*(\tau^{fl}) = F^*(\tau^{fl}) = \int_0^\infty \overline{g} k_0 e^{(\beta-2\bar{g})t} e^{-\delta t} dt = k_0 \left[1 - e^{-(2\overline{g}-\beta+\delta)\tau^{fl}}\right] \frac{\overline{g}}{2\overline{g}-\beta+\delta}. \tag{30}$$

Recall that at time τ^{fl}, the continuation value of leading is $A - Q(k_0 e^{(\beta-2\bar{g})\tau^{fl}}) = 0$. Since $\overline{g} > \beta$, we have that $(2\overline{g} - \beta + \delta) > \overline{g} > 0$. Thus, it follows from (30) and (29) that $L^*(\tau^{fl}) < N^*$. Hence, powerful groups are better off in a no-reform equilibrium than in a leader-follower reform equilibrium for any reform date τ^{fl}.[7]

This result has a number of implications. First, it stresses the strategic interaction between non-cooperative powerful groups which can result in different equilibrium outcomes, with different payoffs. Second, it opens the possibility of observing empirically different dynamics across countries with similar fundamentals, as some might be in a no-reform equilibrium, some might be in a reform equilibrium, and some might even be switch from one to another. This implies that even if *conditional on being in the reform-equilibrium,* the dynamics leading to reforms is deterministic and thus fully predictable, *unconditionally* the occurrence of reforms is not fully predictable. That is even before augmenting the model with exogenous shocks to bring it to the data, there is a source of uncertainty coming from the model's multiplicity of equilibria.

3. Empirical Analysis

Here, we investigate whether deep structural reforms are more likely in the wake of a severe economic crisis than during tranquil times. By deep structural reforms, we mean reforms that

[7] In the case of matching equilibrium, an unambiguos ranking does not exist. This is because if the benefits A_m are large enough and τ^{fl} is large enough, a group's payoff in a matching equilibrium $M^*(\tau^m)$ may be greater than the payoff in a no-reform equilibrium N^* for some $\tau^m \leq \tau^{fl}$. The value of matching is

$$M^*(\tau^m) = k_0 \left[1 - e^{-(2\overline{g}-\beta+\delta)\tau^m}\right] \frac{\overline{g}}{2\overline{g}-\beta+\delta} + \left[A_m - Q_m(k_0 e^{(\beta-2\bar{g})\tau^m})\right] e^{-\delta\tau^m} \tag{31}$$

Notice that $M^*(0) = A_m - Q_m(k_0)$, which is negative by assumption (4). That is, initially available resources are plentiful and so attacking is too costly. Furthermore, $M^*(\tau^m)$ is increasing in τ^m. Thus, conditional on a matching-type reform taking place, powerful groups are better off having it as late as possible: $\tau^m = \tau^{fl}$. However, $M^*(\tau^{fl})$ need not be smaller than N^* if A_m and τ^{fl} are very large.

significantly affect the distribution of rents throughout the economy in contrast to sectorial reforms that only concern one particular segment of the economy.[8] By severe crises, we mean crises whose output costs are several order of magnitude higher that the costs of standard business cycle fluctuations. Severe crises are generally systemic crises, meaning that they have economy-wide consequences rather than being contained in some segment of the financial sector (e.g., the S&L crisis in the US).

In order to make transparent the endogenous dynamics of a deteriorating economy leading to reforms, the model does not include any shocks. In the data, we should rather think of this endogenous dynamics as a source of economic fragility that makes the economy prone to a severe crisis when an exogenous shock hits**.**

We concentrate our analysis on trade liberalization. There are two major advantages in doing so. First, trade liberalization is a prime example of a structural reform that reduces rents of fixed factors in protected sectors rather than just a change in the market structure of one sector.[9] Arguably, the owners of those fixed factors have political power, and so are effective rent-seekers and tend to block reform. Second, there is a widely accepted time dummy measure of trade liberalization, constructed using objective criteria by Sachs and Warner (1995), and updated by Wacziarg and Welsh (2008).

We proceed in two steps. First, we describe how we the trade reform and crisis dummies are constructed. We then investigate whether trade liberalization is more likely in the wake of a severe crisis than during tranquil times.

A. Trade Reform Index

The trade reform dummy, which we use without altering it, classifies a country as closed if it displays at least one of the following trade-policy related characteristics:

1. Average tariff rates of 40 percent of more (TAR).

2. Nontariff barriers covering 40 percent or more of trade (NTB).

[8] For example, the end of a state monopoly in the telecom industry is likely to reduce communication costs, but is unlikely to significantly redistribute rents between economic groups.

[9] Trade liberalization tends to have large aggregate effects - on growth, investment, trade volume - but these effect are very different accross different structures of the economy (Muendler.+ reference.). In particular, trade liberalization generates a deep structural change that reduces the rents of fixed factors in protected sectors.

3. A black market exchange rate at least 20 percent lower than the official exchange rate (BMP).

4. A state monopoly on major exports (XMB).

5. A socialist economic system (as defined by Kornai 1992) (SOC).

This index has been constructed by Sachs-Warner (1995), and updated by Wacziarg and Welch (2006) for the more recent period, and for a larger sample of countries. The trade reform dummy equals one the year the reform is coded and zero otherwise. According to Wacziarg and Welch, 73 countries experienced trade liberalization between 1970 and 2003. In this period, 2 countries experienced a first episode of trade liberalization (Venezuela, 1989 and Sri-Lanka, 1977), before closing and reopening again in 1996 and 1991 respectively. Abstracting from these two cases, all countries that liberalized trade in our sample remained continuously open since then.[10]

B. De Facto Crisis Index

Because we want to investigate whether trade liberalization is triggered by a severe crisis, the precise dating of the onset of severe crises is key. Unfortunately there does not exist in the literature a uniform index that measures in an objective way–for a large panel of countries–the occurrence of severe crises. The existing de Jure crisis indexes have several shortcomings. First, because they are not based on pure objective criteria, they tend to mix severe crises with mild episodes**.** Second, many de jure indexes, record an implausibly large of number of country-years with crises (in some cases more than 20%). Meanwhile, they miss some severe crises. Third, as documented in Ranciere, Tornell, and Westermann (2008), de jure indexes often contradict each other in a very large proportion**.**

We propose a de facto criterion to detect the onset of severe crises, which is designed to avoid these shortcomings and it enables us to obtain a consistent data set for a large panel of countries over the period 1970-2010. As we show in the appendix, there is a fairly close, although not perfect, correspondence between our de facto crisis index and existing de jure indexes. Furthermore, our results regarding the link between crises and reforms are robust to using standard De Jure indexes.

[10] For Venezuela and Sri-Lanka we consider the second (and permanent) trade reform as the reform date.

De Facto Crisis Index. We define a severe economic crisis as being either a growth crisis or an inflation crisis. A growth crisis is triggered by GDP growth falling at least 1.6 standard deviations below its 10-year moving average. The 10-year moving average is computed over a window of 10 years around a central year, which is not used for the MA computation. The standard deviation is computed, for each country, over the full sample period. A de facto inflation crisis is computed in a similar way. An inflation crisis is triggered if inflation surpasses 1.6 standard deviations above its 10-year moving average and, in addition, inflation is greater than 20 percent. We include the 20% inflation threshold in order to rule out false signals triggered by an inflation increase from a low level, say from 1% to 1.5%.

This method identifies the year of the onset of a severe economic crisis, but it does not inform us about its duration. This approach is appropriate for our purposes, as we want to analyze the propensity to reform in the years following the onset of a severe crisis. If our method detects two crises in adjacent years, we consider the first of these two years to mark the onset of the crisis.

The sample covers 133 countries over the period 1970-2010 and includes all countries with growth and inflation data available in the Word Development Indicator or International Financial Statistics[11]. Out of 5896 country-year observations in our sample, we identify 494 country-years with crises. The probability to enter into a crisis for a given country-year is equal to 7.95 percent. This percentage is significantly smaller than typical across de jure indexes, and so it makes it more difficult to reject the null that reforms are not triggered by crises.

In the appendix, we compare the list of crises generated by our de facto methodology with a list of de jure crises reported in the literature. We find that in 78 percent of the cases, a de jure crisis can be identified within an interval of four years around the onset of the de facto crisis. Conversely in 62 percent of the cases, a de facto crises can be identified within an interval of four years around the onset of a consensus de jure crisis, i.e., a crisis confirmed by at least two sources.

[11] In addition, we recover inflation data for some countries missing in WDI or IFS using Global Financial Data.

C. Trade Reform and Severe Economic Crises

We first assess the link between trade reform and severe crises by performing a simple counting exercise that computes the probability of observing a crisis conditional on observing a reform, and also the probability of observing a reform conditional on observing a crisis. We then run a series of logit regressions to assess the predictive power of crises on the occurrence of trade reform, controlling for political change, trade reform and crises in neighboring countries, as well as county-specific fixed effects.

The sample consists of all countries that experienced a trade reform between 1970 and 2005. Countries that have been liberalized before 1970 or have never been liberalized are excluded from the analysis.

A challenge for the analysis is to account for the fact that there is usually a time lag between the onset of a crisis and the passing of trade reform. We deal with this issue either by considering time windows (in the conditional probability exercise) or by using a rich lag structure (in the logit regressions).

Before computing the full set of conditional probabilities, it is useful to zoom, for each country, on the year of the reform and the 5 preceding years, and to look at how often countries tend to experience a crisis in those time windows. There are 65 countries experiencing a trade reform and for which our crisis index can be computed in the five years before the reform date. As we can see in Table 1, out of these 65 countries, 30 experience the onset of a crisis either the year of the reform or the year preceding it. They include well-known cases such as Mexico (Crisis and Reform in 1986), Brazil (Crisis in 1990, Reform in 1991), Chile (Crisis in 1975, Reform in 1976), Israel (Crisis in 1984, Reform in 1985), Niger (Crisis in 1994, Reform in 1994), Poland (Crisis in 1989, Reform in 1990) and Turkey (Crisis in 1988, Reform in 1989). Twenty other countries experience a crisis between 2 and 5 years before the year trade reform is coded. These include notable cases such as Argentina (Crisis 1989, Reform in 1991), Peru (Crisis in 1998, Reform in 1991), and Pakistan (Crisis in 1997, Reform in 2001). For only 15 countries (less than a quarter of the reform countries), our methodology does not identify the onset of a crisis within a five-year window preceding the trade reform date. In the appendix, we repeat the same exercise with the de jure crisis index of Laeven and Valencia (2012) and find very similar results (Table A1). Interestingly, there are only 5 coded reforms (Bangladesh 1996, Ecuador 1991, Hungary 1990, New Zealand 1986, and South Africa 1991) for which there is neither a de facto nor a de jure crisis in the five years preceding the coded reform.

C.1 Conditional Probability Analysis

In order to compute the conditional probabilities, we proceed as follows. First, we consider a time window of one to five years ending the year of the trade reform (we call this time frame a "reform window"). Second, we partition the years before the reform window into non-overlaping windows of the same length (one to five years).[12] Unconditional and conditional probabilities, for a given window length, can thus be computed as follows:

$$\begin{aligned}
\Pr(Crisis) &= \frac{\#\text{ windows with a crisis}}{\#\text{ windows}} \\
\Pr(Reform) &= \frac{\#\text{ of reform windows}}{\#\text{ windows}} \\
\Pr(Crisis|Reform) &= \frac{\#\text{ of reform windows with a crisis}}{\#\text{ of reform windows}} \\
\Pr(Crisis|No\ Reform) &= \frac{\#\text{ non-reform windows without a crisis}}{\#\text{ of non reform windows}} \\
\Pr(Reform|crisis) &= \frac{\#\text{ of reform windows with a crisis}}{\#\text{ windows with a crisis}} \\
\Pr(Reform|No\ crisis) &= \frac{\#\text{ of reform windows with a crisis}}{\#\text{ windows without a crisis}}
\end{aligned}$$

The above makes clear that the conditional probabilities are related through Bayes law:

$$\begin{aligned}
\Pr(Crisis|Reform) &= \Pr(Reform|crisis)\frac{P(Crisis)}{P(Reform)} \\
\Pr(Crisis|No\ Reform) &= (1-\Pr(Reform|Crisis))\frac{1-P(Crisis)}{1-P(Reform)}
\end{aligned}$$

In order to summarize the information content of the conditional probabilities for understanding the link between crises and reforms, we compute the following odds ratios:

$$\begin{aligned}
O_C &= \left(\frac{\Pr(C|R)}{1-\Pr(C|R)}\right)\Big/\left(\frac{\Pr(C|NR)}{1-\Pr(C|NR)}\right) \\
O_R &= \left(\frac{\Pr(R|C)}{1-\Pr(R|C)}\right)\Big/\left(\frac{\Pr(R|NC)}{1-\Pr(R|NC)}\right)
\end{aligned}$$

O_C measures the effect of falling into a reform window on the odds of observing a crisis. Meanwhile, O_R measures the effect of falling into a crisis window on the odds of observing

[12] Note that since the number of years prior to reform is not necessarily a multiple of the length of the window, the pre-reform window that precedes the reform window is sometimes of a shorter length than the others. Discarding these shorter windows, however, barely changes the results.

a reform. An odds ratio larger than one indicates that being in a reform (crisis) window increases the odds of observing a crisis (reform). The larger the odds ratio, the stronger the correspondence between crises and reforms. Computing odds ratios also allows us to relate the results of this counting exercise to the logit regression results presented below.[13]

As we show in the appendix, these two odds ratios are equal, even if the underlying marginal probabilities are different.[14] This convenient property becomes clear when odds ratios are re-expressed using joint probabilities:

$$O_C = \frac{\frac{\Pr(C\&R)}{\Pr(C\&NR)}}{\frac{\Pr(NC\&R)}{\Pr(NC\&NR)}} = \frac{\frac{\Pr(C\&R)}{\Pr(NC\&R)}}{\frac{\Pr(C\&NR)}{\Pr(NC\&NR)}} = O_R \tag{32}$$

Table 2 reports the conditional and unconditional probabilities, as well as the corresponding odds ratios for different window sizes $\{1, 2, ..., 5\}$. The first line of Table 2 considers windows of unit length, i.e., it contrasts the years with a reform with the years without a reform. In this case the probability of observing a crisis the very same year of a reform is 23 percent vs. 9.7 percent of observing a crisis during a no-reform year. This yields an odds ratio of 2.77. When the window length is 3, the probability of observing a crisis either the year of the reform or 2 years before is 54% vs. 23% in any window of the same length, but without a reform (the odds ratio is 3.57). With a 5-year window, the probability of observing a crisis either the year of the reform or 4 years before is 71% vs. 32% in any window of the same length, but without a reform (the odds ratio is 5.08).

The pattern for the probability of a reform conditional on observing a crisis is similar to the one above and, as discussed the odds ratios are exactly the same.

C.2 Logit Regression Analysis

Here, we test the null hypothesis H_0^R that severe economic crises do not increase the likelihood of trade reform. We do so by estimating a probabilistic model of trade reform in country i occurring within the time range $t+1$ to $t+h$ (with $h = 1, 2, 3$), as a function of a crisis dummy and a set of control variables measured at time t. That is, we estimate the following

[13] As we shall remind the reader in the next subsection, the logit model can be represented as a linear regression of the log of the odds of experiencing a reform on several explanatory variables.

[14] In medical terms, the ratio of odds of being cured conditional on taking medicine over the odds of being cured conditional on not taking medicine is about the same as the odds ratio of having taken the medicine conditional on being cured over the odds of not having taken the medicine conditional on being cured.

regression.

$$logit\left(REF_{i,t+h}\right) = \alpha_{0i} + \alpha_1 Crisis_{i,t} + \alpha_2 Z_{i,t} + u_{i,t}, \qquad h = \{1,2,3\}. \tag{33}$$

The logit function is the log-odds of a reform, $logit\left(REF_{i,t+h}\right) = \log\left(\frac{Pr(REF_{i,t+h})}{1-Pr(REF_{i,t+h})}\right)$, with:

- $REF_{i,t+h} = 1$ if there is a trade reform coded in country i at time $t+h$.
- $Crisis_{i,t} = 1$ if there is a de-facto crisis in country i at time t.
- $Z_{i,t}$ is a set of controls that includes drastic political change, trade reform in a neighboring country, and crisis in a neighboring country.
- α_{0i} is a country specific fixed effect.
- $u_{i,t}$ is a logistically distributed random disturbance.

This specification is standard in the early warning crisis literature (Gourinchas and Obstfeld, 2011). The rationale for extending forward the reform dummy is to account for the various possible lags between the crisis occurrence and that of a reform in a parsimonious way. In the robustness section (Section 3.4), we consider an alternative approach with a number of crisis lag dummies entering directly in the specification.

The estimation sample consists of 62 (out of the 65) countries that have experienced trade reform between 1970 and 2006 and for which the information necessary to build our de facto crisis index is available. The panel is unbalanced—e.g., for some transition economies there is no de facto crisis information until the late 1980s—and therefore the unconditional probability of reform differs from country to country. The country-fixed effect allows us to control for these differences.

Since all the independent variables are dummies, their effect is best represented using odds ratios. That is, by estimating by how much the odds of observing a reform increases multiplicatively, with a one-unit change in the independent dummy variables. Since the log odds in (33) is a linear function of the dummies, the associated odds ratios are obtained by a simple exponential transform of the linear coefficient :

$$\widehat{OR(\alpha_j)} = \exp\left(\widehat{\alpha_{0i}} + \widehat{\alpha_j}\right).$$

Table 3 reports the estimated odds ratios computed for the average value of the fixed effect ($\overline{\alpha_0}$), along with their standard errors. A zero-to-one change in a dummy variable

significantly increases the odds of observing a reform only if the odds ratio is significantly large than one. The first 3 columns of Table 3 are estimated with $h = 1$. That is, they consider the predictive power of a crisis on the occurrence of a reform in the next year. In the absence of any controls, the odds ratio associated with the crisis dummy is equal to 3.067 and is significantly different from 1 at the one percent confidence level. This means that the odds of observing a reform in the year following a crisis is multiplied by about a factor of 3. The estimate does not change when a political change dummy variable is included, and is only modestly reduced (from 3.067 to 2.687) when the two other controls—neighborhood trade reform and neighboring crisis—are added to the regression. The stability of the estimates is specially noticeable because each of the other controls have themselves odds ratios that are significantly larger than one.

The last three columns of Table 3 present the regression results for $h = 3$. That is, they test whether a crisis predicts a reform up to 3 years ahead. The results are similar, but the odds ratio associated with a crisis dummy, while significant at the one percent confidence level, are smaller by about 0.7. This indicates a lesser power of crises to predict reforms two or three years ahead than one year ahead.

In short, the estimation results strongly reject the hypothesis that crises do not predict reforms and are robust to the inclusion of other commonly mentioned explanations for trade reform, such as political change or neighboring countries trade reforms.

D. Robustness

In this subsection, we analyze the robustness of our estimation results to the use of De Jure crisis indexes and to the introduction of a lag structure in the crisis index.

D.1 De Jure Crisis

The analysis presented above is based on our De Facto crisis index. Here we show how our main results are robust to using instead the De Jure systemic crisis index compiled by Laeven and Valencia (2012).

Table 4 reports the conditional and unconditional probabilities, as well as the corresponding odds ratios for different window sizes $\{1, 2, ..., 5\}$. The probability of observing a crisis the very same year of a reform is 15.38 percent vs. 9.17 percent of observing a crisis during a no-reform year. This yields an odds ratio of 1.8. With a 5-year window, the probability

of observing a crisis either the year of the reform or 4 years before is 63% vs. 27% in any window of the same length, but without a reform (the odds ratio is 4.58). Overall the results are very much in line, although slightly weaker, with those obtained with our de Facto crisis.

Table 5 present the results of the fixed effect logit regression using the De Jure index. Once again the results are very similar although slightly weaker than those obtained with the De Facto index. Observing a De Jure crisis increases the odds of observing a trade reform with coefficients ranging from 1.8 to 2.8, and significant at a one-percent confidence interval.

D.2 Lagged Crisis Dummies

The main logit specification considers the effect of a crisis occurring at t on the occurrence of a trade reform between $t+1$ and $t+h$. We consider here the following alternative specification:

$$logit\left(REF_{i,t}\right) = \alpha_1(L)Crisis_{i,t} + \alpha_2(L)Z_{i,t} + u_{i,t},$$

where the dummy $REF_{i,t}$ equals one if there is trade reform in country i at time t and zero otherwise; the dummy $Crisis_{i,t-h}$ equals one if there is a de-facto crisis in country i at time t-h and zero otherwise; X_i is a fixed effect, $Z_{i,t}$ is the same set of controls, and $\alpha_1(L)$ and $\alpha_2(L)$ are lag polynomials which contain terms ranging from zero to four lags. This specification allows for different lags of the crisis dummies to have a *different impact* on the occurrence of a reform. This approach is also in line with the evidence of Table 1 which shows a rich array of possible lags between crisis and reforms.

The results are presented in Table 6, with controls and their lags gradually introduced in subsequent columns. The crisis dummy and its first, second, and fourth lags, have all a significant impact on the odds of observing a reform. The estimated odds ratio are both very large and highly significant. At one lag, the odds ratios range between 4.2 and 4.6. These results remain barely unchanged when controls for political change, neighborhood trade reform, and neighboring crises are introduced, contemporaneously and with up to 4 lags.

4. Literature Review

There is a rich literature on the link between structural reform and economic crises. Here, we comment on a few related papers. Alesina and Drazen (1991) explain why there is delay

in *stabilization programs* stipulating the sacrifices each group accepts in order to reduce the fiscal deficit. They consider a war-of-attrition in which the game is over when one group concedes, but as long as the game continues both groups incur a cost. Because there is uncertainty about the costs of other groups, delay serves as a mechanism to reveal which group is weaker. By waiting groups induce the weaker to concede first. In this paper, we ask a different question and focus instead on *reform.* There is a subtle, but important difference, while in a reform groups lose their power to appropriate rents forever, under stabilization they simply agree to moderate their fiscal appropriations, but they keep their power to increase them in the future. This leads us to consider a preemption game in which a player incurs a cost only when it undertakes an action to destroy the power of others. Because such an action entails a cost, each player moves as late as possible, provided others also wait. However, because introducing the new technology first gives a first-mover advantage, eventually there are incentives to preempt. Preemption games are often used to analyze the adoption of a new technology (e.g., Fudenberg and Tirole (1985)).

Our model applies to different situations than Alesina and Drazen's model. Their model applies to situations where powerful groups stand to gain from a stabilization agreement where each has to make a sacrifice. Meanwhile, our model applies to structural reforms that make some or all powerful groups worse-off. Another difference is the role of asymmetric information. In our setup, reform is delayed until the economy deteriorates enough even if all groups know the end-outcome. In Alesina and Drazen, there is immediate agreement if asymmetric information is absent.

In Fernandez and Rodrick (1991) there is a status-quo bias against reform because there is uncertainty about the winners and losers of reform. Thus reforms that may benefit the majority may be rejected by voters.

Easterly and Drazen (2001) note that the empirical literature on the crisis-induced-reform hypothesis is far less developed than the theoretical one. They suggest this is probably because the crisis-reform link is often somewhat (mis)perceived as tautological.[15] They test whether macroeconomic circumstances must become extremely bad in order for an economy to experience a turnaround leading to a sharp improvement. They find evidence of such pattern for extreme values of inflation and the black market premium. For example, they

[15]They cite Rodrik (1996), who frames this kind of tautological argument as follows: "Reform naturally becomes an issue only when policies are perceived not to be working. A crisis is just an extreme case of policy failure. That reform should follow crisis, then, is no more surprising than smoke following fire."

show that while inflation reverses in a few years to a level of around 10 percent following an episode of inflation above 1000 percent, the mean reversion is much slower following episodes of inflation ranging between 40 and 1000 percent. While their results are consistent with ours, we shall stress that they test the link between crisis and *stabilization* rather than the link between crisis and reform. In fact, they do not make any reference to particular types of reforms nor use reform data, in their empirical analysis. Alesina, et. al. (2006) find similar results and characterize the types of government that makes the crisis-stabilization link stronger. They also find that external inducement, like IMF programs, has little impact on stabilization, stressing like us, the primacy of internal dynamics over external forces for explaining the crisis-stabilization link. Giuliano et al. (2013) consider six sectorial regulation indices and find that a democratic regime is more likely to lead to a reduction in the intensity of regulation. In their regressions, a dummy for high inflation (>40 percent) has no significant impact on next period's change in regulation intensity. In one robustness regression, a dummy for banking crisis, that mixes borderline and severe systemic cases, exhibits a negative impact on regulatory change. These results are not comparable to ours as their focus is not on the effect of severe crises on a single and well identified drastic reform (trade liberalization).

The historical sociology literature has studied the origins of revolutions, which are an extreme form of reform. A common factor across several revolutions, in which there is institutional change, has been the breakdown of the intra-elite cohesion. Going back to the 1500s, Goldstone (1991) documents a tendency for such intra-elite brake ups to occur during fiscal crises. In particular, in the case of the French Revolution, the consensus now is that its origins lie in a deep fiscal crisis (Doyle (1980), Skocpol (1979)). In several cases, popular uprisings have followed such an intra-elite break-ups, but they are not the root cause. While popular uprisings erupt all the time, not many lead to either structural reform or revolution.

An analysis of the role of a severe crisis in inducing trade reform has been done by Velasco (1994) for Chile and by Tornell (1995) for Mexico.

5. Conclusions

We have found a robust empirical link between economic crises and trade liberalization, a prime example of structural reform. While structural reforms may be good for the economy as a whole, they are typically delayed until the economy has decayed.

To rationalize this fact, we have presented a model in which organized groups have the

power to extract resources from the rest of the economy. Reform, which eliminates such power for some or all groups, is the outcome of a social conflict in which some powerful groups take action to curb the power of their rivals. Since these actions are costly in terms of forgone rents, reform does not occur in good times. The model yields an equilibrium, in which powerful groups find it optimal to engage in excessive rent-seeking and, in doing so, drive the economy into a crisis, even though they know that crisis will induce conflict and reform.

In our setup trade liberalization is not imposed by external pressure (e.g., by stabilization programs imposed by international organizations). Rather, it occurs when protected industrialists cease to block such reform. Even though protected producers dislike trade liberalization, they find it is a way to stop expropriations by other powerful groups such as statist groups and unions, as illustrated by the experiences of Chile (in the 1970s) and Mexico (in the 1980s).

A policy implication is that large-scale lending programs from international organizations intended to provide a window of opportunity for a country to implement reforms, may instead reduce the incentives of powerful groups to allow reform. The unintended consequence may simply be a delay in reforms and an increase in the debt-to-GDP ratio, as shown by the experience of countries like Greece and Italy in the wake of the the Eurozone crisis.

References

[1] Alesina, A. and A. Drazen, 1991, "Why Are Stabilizations Delayed?," *American Economic Review*, vol. 81(5), pages 1170-88.

[2] Alesina, A., S. Ardagna, and F. Trebbi, 2006, "Who Adjusts and When? The Political Economy of Reforms", *IMF Staff Papers*, 53:1-29.

[3] Drazen, A. and W. Easterly, 2001, "Do Crises Induce Reform? Simple Empirical Tests of Conventional Wisdom," *Economics and Politics*, vol. 13(2), pages 129-157, 07.

[4] Doyle, W., 1980, *Origins of the French Revolution*, Oxford University Press.

[5] Fernandez, R. and D. Rodrick, 1991, "Resistance to Reform: Status Quo Bias in the Presence of Individual-Specific Uncertainty," *American Economic Review*, vol. 81(5), pages 1146-55.

[6] Fudenberg, D. and J. Tirole, 1985, Preemption and Rent Equalization in the Adoption of a New Technology," *Review of Economic Studies*, 52, 383-401.

[7] Giuliano, P., P. Mishra, and A. Spilimbergo, 2013, "Democracy and Reforms: Evidence from a New Dataset," *American Economic Journal: Macroeconomics*, vol. 5(4), pages 179-204, October.

[8] Goldstone, J., 1991, *Revolution and Rebellion in the Early Modern World*, University of California Press.

[9] Laeven, L., and Valencia, F., 2012, "Systemic Banking Crises Database: An Update," IMF Working Papers 12/163.

[10] Rodrik, D., 1996, "Understanding Economic Policy Reform", *Journal of Economic Literature*, 34, 9-41.

[11] Sachs., J. and A. Warner, 1995, "Economic Reform and the Process of Global Integration," *BPEA*.

[12] Skocpol, T., 1979, *States and Social Revolutions: A Comparative Analysis of France, Russia and China*, Cambridge University Press.

[13] Tornell, A., 1995, "Are Economic Crises Necessary for Trade Liberalization and Fiscal Reform?" in Dornbusch, R. and S. Edwards, eds. *Growth, Stabilization and Reform*, University of Chicago Press.

[14] Velasco, A., 1994, "The State and Economic Policy: Chile 1952-1992," in Bosworth, B., Dornbusch, R. and Laban, R., *The Chilean Economy: Policy Lessons and Challenges,* Washington DC: The Brookings Institution.

[15] Wacziarg, R. and K. H. Welch, 2008, "Trade Liberalization and Growth: New Evidence," *World Bank Economic Review*, vol. 22(2), pages 187-231.

Appendix

A Correspondence Between De Facto and De Jure Crises

We assemble a data set of the most commonly used de Jure crisis indexes covering banking crises, currency crises and sovereign debt crises, and analyze the correspondence between our de facto crisis indicator and such de jure crisis indicators. Several issues make such comparison challenging. First, de jure indexes contradict each other a good deal. Second, the samples across indexes do not coincide. Third, de jure indicators report the entire crisis period while our de facto index only identifies the year of the onset of the crisis.

First, we investigate whether our de facto severe crises have a corresponding de jure crisis. We find that 55% of the de facto crises coincide with a de jure crisis the same year. The percentage of matches increases to 72% when we consider a window of one year before and one year after the de facto crisis, and to 78% when we consider a window of two years. The use of 3 and 5 year windows deals with potential measurement error in the coding of the crisis dates.

Second, we flip the problem and investigate the correspondence in the other direction (i.e., whether de jure crises have a corresponding de facto crisis). Here, we need to address the fact that there are way too many de jure crises (41% country-years, while there are only 8% de facto crises). We address first this issue by considering consensus de jure crises, defined as crises that have been spotted by at least two different data sources. Restricting to consensus de jure crisis reduces the share of country-years to 13%. Second we filter consensus crises to isolate the onset years. When this filter is applied, the frequency of crises drops to 4.2% that is about half the frequency of de facto crises. When a window of three years (five years) is considered, 45% (62%) of the onset years of the consensus de jure crises are matched with de facto crises.

Overall the correspondence between de facto and de jure crises is relatively high, but it is far from perfect. The correspondence from de facto crises to any type of de jure crisis tends to overestimate the quality of the match because of the high number of recorded de jure crises episodes. The correspondence from consensus de jure crises to de facto crises is likely to underestimate the quality of the match because the meaning of the onset year differs for

consensus de jure crises and for de facto crises. For de facto crises, the onset year is when an objective criteria is triggered. Meanwhile, for de jure crises, the onset of a crisis is obtained when two sources start to agree, which can be well into the crisis rather than at its onset.

Table A lists the 474 severe economic crises identified by our de facto index in a sample that overlaps with the sample of de jure crises; in bold are those that correspond with a de jure crisis within a five year window (either the same year, or two years before, or two years after). Table B lists the 244 onset years of consensus crises; in bold are those that correspond with a de facto crisis within a five year window.

B Derivation of Equation (32)

The odds ratio of a crisis is given by:

$$\begin{aligned} O_c &= \left(\frac{\Pr(C|R)}{1-\Pr(C|R)}\right) \Big/ \left(\frac{\Pr(C|NR)}{1-\Pr(C|NR)}\right) \\ &= \frac{\Pr(C\&R)}{\Pr(C\&NR)} \frac{1-\Pr(R)-\Pr(C\&NR)}{P(R)-\Pr(C\&R)} \\ &= \frac{\Pr(C\&R)\Pr(NC\&NR)}{\Pr(C\&NR)\Pr(NC\&R)} \end{aligned}$$

The odds ratio of a reform is given by:

$$\begin{aligned} O_r &= \left(\frac{\Pr(R|C)}{1-\Pr(R|C)}\right) \Big/ \left(\frac{\Pr(R|NC)}{1-\Pr(R|NC)}\right) \\ &= \frac{\Pr(C\&R)}{\Pr(NC\&R)} \frac{1-\Pr(C)-\Pr(NC\&R)}{P(C)-\Pr(C\&R)} \\ &= \frac{\Pr(C\&R)}{\Pr(NC\&R)} \frac{\Pr(NC\&NR)}{\Pr(C\&NR)} \\ &= \frac{\Pr(C\&R)\Pr(NC\&NR)}{\Pr(C\&NR)\Pr(NC\&R)} \\ &= O_c \end{aligned}$$

TABLE 1. Crises and Trade Reforms

Country	Crisis Year	Reform Year
I Reform and Crisis Contemporaneous		
Albania	1992	1992
Azerbaijan	1995	1995
Bolivia	1985	1985
Cote d'Ivoire	1994	1994
Cape Verde	1991	1991
Kenya	1993	1993
Kyrgyz Republ	1994	1994
Lithuania	1993	1993
Moldova	1994	1994
Mexico	1986	1986
Macedonia, FY	1994	1994
Niger	1994	1994
Nicaragua	1991	1991
Uruguay	1990	1990
Venezuela, RB	1996	1996
II Reform and Crisis (one year lag)		
Armenia	1994	1995
Benin	1989	1990
Bulgaria	1990	1991
Brazil	1990	1991
Chile	1975	1976
Colombia	1985	1986
Georgia	1995	1996
Honduras	1990	1991
Israel	1984	1985
Latvia	1992	1993
Panama	1995	1996
Poland	1989	1990
Romania	1991	1992
Turkey	1988	1989
Tanzania	1994	1995
III Reform and Crisis (two years lag)		
Argentina	1989	1991
Dominican Rep	1990	1992
Egypt, Arab Re	1993	1995
Ghana	1983	1985
Madagascar	1994	1996

Country	Crisis Year	Reform Year
IV Reform and Crisis (three years lag)		
Armenia	1992	1995
Botswana	1976	1979
Morocco	1981	1984
Mozambique	1992	1995
Peru	1988	1991
Tunisia	1986	1989
Uganda	1985	1988
V Reform and Crisis (four years lag)		
Burkina Faso	1994	1998
Pakistan	1997	2001
Philippines	1984	1988
El Salvador	1985	1989
Zambia	1989	1993
VI Reform and Crisis (five years lag)		
Costa Rica	1981	1986
Ethiopia	1991	1996
Jamaica	1984	1989
VII Reform and No Crisis		
Burundi	NA	1999
Bangladesh	NA	1996
Cameroon	NA	1993
Ecuador	NA	1991
Gambia, The	NA	1985
Guatemala	NA	1988
Hungary	NA	1990
Sri Lanka	NA	1991
Mauritania	NA	1995
Nepal	NA	1991
New Zealand	NA	1986
Paraguay	NA	1989
Tajikistan	NA	1996
Tajikistan	NA	1996
Trinidad and Tobago	NA	1992

Table 2. Reform and De Facto Crisis: Conditional Probabilities

Length of windowns	Prob(Crisis | Reform)	Prob(Crisis |No Reform)	Prob(Crisis)	Odds Ratio
1	23.08%	9.76%	10.54%	2.77
2	46.15%	17.29%	20.56%	4.10
3	53.85%	24.62%	29.40%	3.57
4	63.08%	28.45%	35.86%	4.30
5	70.77%	32.28%	42.13%	5.08
Length of windowns	Prob(Reform | Crisis)	Prob(Reforms | No Crisis)	Prob(Reform)	Odds Ratio
1	12.71%	4.99%	5.80%	2.77
2	25.42%	7.68%	11.32%	4.10
3	29.91%	10.68%	16.33%	3.57
4	37.61%	12.31%	21.38%	4.30
5	42.99%	12.93%	25.59%	5.08

Table 3. Fixed Effects Logit Regressions: Trade Refoms and De Facto Crisis

Dep Variable	Trade Reform t+1	Trade Reform t+1	Trade Reform t+1	Trade Reform t+1 to t+3	Trade Reform t+1 to t+3	Trade Reform t+1 to t+3
	odds ratio	**odds ratio**	**odds ratio**	**odds ratio**	**odds ratio**	**odds ratio**
De Facto	3.067***	3.061***	2.687***	2.319***	2.322***	2.092***
	(0.931)	(0.932)	(0.834)	(0.485)	(0.488)	(0.450)
political reform		2.586**	2.412**		2.178***	2.006**
		(1.036)	(0.970)		(0.585)	(0.548)
neighbor trade reform			2.152**			2.790***
			(0.675)			(0.537)
Neighbor crisis			1.604*			1.522**
			(0.436)			(0.252)
Observations	2,286	2,286	2,286	2,286	2,286	2,286
Number of code	62	62	62	62	62	62
Pseudo R-squared	0.0253	0.0358	0.0567	0.0132	0.0202	0.0534

Table 2. Reform and De Jure Crisis: Conditional Probabilities

Length of windowns	Prob(Crisis | Reform)	Prob(Crisis |No Reform)	Prob(Crisis)	Odds Ratio
1	15.38%	9.17%	9.47%	1.80
2	32.31%	15.58%	17.11%	2.59
3	46.15%	20.19%	23.66%	3.39
4	53.85%	24.59%	29.73%	3.58
5	63.08%	27.16%	34.74%	4.58
Length of windowns	Prob(Reform | Crisis)	Prob(Reforms | No Crisis)	Prob(Reform)	Odds Ratio
1	7.63%	4.39%	4.70%	1.80
2	17.36%	7.51%	9.19%	2.59
3	26.09%	9.43%	13.37%	3.39
4	31.82%	11.54%	17.57%	3.58
5	38.32%	11.94%	21.10%	4.58

Table 5. Fixed Effect Logit Regressions: Trade Refoms and De Jure Crisis

Dep Variable	Trade Reform t+1	Trade Reform t+1	Trade Reform t+1	Trade Reform t+1 to t+3	Trade Reform t+1 to t+3	Trade Reform t+1 to t+3
	odds ratio	**odds ratio**	**odds ratio**	**odds ratio**	**odds ratio**	**odds ratio**
De jure crisis	2.880***	2.540***	2.383***	2.225***	2.001***	1.858***
	(0.922)	(0.813)	(0.764)	(0.478)	(0.433)	(0.408)
Political reform		1.773	1.627		2.040***	1.858**
		(0.746)	(0.690)		(0.530)	(0.493)
Neighbor Trade Reform			2.101**			2.872***
			(0.659)			(0.541)
Observations	2,327	2,078	2,078	2,327	2,078	2,078
Number of code	64	62	62	64	62	62
Pseudo R-squared	0.0195	0.0209	0.0325	0.0107	0.0156	0.0426

Table 6. Crises and Reforms: Alternative Specifications

Dependant Variable	Trade Reform	Trade Reform	Trade Reform	Trade Reform
	odds ratio	**odds ratio**	**odds ratio**	**odds ratio**
crisis	3.201***	3.227***	3.038***	2.945**
	(1.281)	(1.299)	(1.254)	(1.235)
L.crisis	4.668***	4.665***	4.246***	4.410***
	(1.766)	(1.777)	(1.689)	(1.769)
L2.crisis	2.092	1.956	1.779	1.781
	(1.075)	(1.012)	(0.955)	(0.966)
L3.crisis	3.814***	3.397***	3.051***	3.156***
	(1.534)	(1.390)	(1.307)	(1.367)
L4.crisis	2.841**	2.696**	2.509**	2.661**
	(1.194)	(1.146)	(1.092)	(1.174)
political_reform		1.270	1.149	1.180
		(0.699)	(0.645)	(0.660)
L.political_reform		2.788**	2.905**	3.089**
		(1.189)	(1.281)	(1.379)
L2.political_reform		1.938	1.767	1.745
		(0.908)	(0.865)	(0.859)
L3.political_reform		0.816	0.817	0.809
		(0.510)	(0.511)	(0.508)
L4.political_reform		1.108	1.013	1.050
		(0.619)	(0.584)	(0.604)
neighbour_trade_reform			3.857***	3.794***
			(1.224)	(1.225)
L.neighbour_trade_reform			0.962	1.042
			(0.348)	(0.392)
L2.neighbour_trade_reform			0.964	0.826
			(0.354)	(0.319)
L3.neighbour_trade_reform			2.080**	2.092**
			(0.706)	(0.715)
L4.neighbour_trade_reform			1.002	1.021
			(0.394)	(0.408)
neighbour_crisis				1.238
				(0.379)
L.neighbour_crisis				0.967
				(0.305)
L2.neighbour_crisis				1.103
				(0.347)
L3.neighbour_crisis				1.514
				(0.466)
L4.neighbour_crisis				0.651
				(0.206)
Observations	1,441	1,441	1,441	1,441
Number of code	55	55	55	55
Pseudo R-squared	0.0699	0.0874	0.161	0.174

seEform in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE A1. De Jure Crises and Trade Reforms

Country	Crisis Year	Reform Year
I Reform and Crisis Contemporaneous		
Azerbaijan	1995	1995
Chile	1976	1976
Cote d'Ivoire	1994	1994
Gambia, The	1985	1985
Israel	1985	1985
Kenya	1993	1993
Paraguay	1989	1989
El Salvador	1989	1989
Uganda	1988	1988
Uruguay	1990	1990
II Reform and Crisis (one year lag)		
Armenia	1994	1995
Bulgaria	1990	1991
Brazil	1990	1991
Colombia	1985	1986
Guyana	1987	1988
Honduras	1990	1991
Lithuania	1992	1993
Latvia	1992	1993
Morocco	1983	1984
Mali	1987	1988
Nicaragua	1990	1991
III Reform and Crisis (two years lag)		
Argentina	1989	1991
Benin	1988	1990
Dominican Rep	1990	1992
Ghana	1983	1985
Guatemala	1986	1988
Sri Lanka	1989	1991
Madagascar	1994	1996
Romania	1990	1992
Venezuela, RB	1994	1996
IV Reform and Crisis (three years lag)		
Ethiopia	1993	1996
Nepal	1988	1991
Peru	1988	1991
Sierra Leone	1998	2001
Trinidad and Tc	1989	1992
V Reform and Crisis (four years lag)		
Burkina Faso	1994	1998
Bolivia	1981	1985
Cameroon	1989	1993
Georgia	1992	1996
Mexico	1982	1986
Zambia	1989	1993
VI Reform and Crisis (five years lag)		
Costa Rica	1981	1986
Egypt, Arab Rep.	1990	1995
Georgia	1991	1996
Israel	1980	1985
Philippines	1983	1988
Turkey	1984	1989
Tanzania	1990	1995
VII Reform and No Crisis		
Albania	NA	1992
Bangladesh	NA	1996
Botswana	NA	1979
Czech Republic	NA	1991
Ecuador	NA	1991
Hungary	NA	1990
Indonesia	NA	1970
Jamaica	NA	1989
Kyrgyz Republic	NA	1994
Moldova	NA	1994
Mozambique	NA	1995
New Zealand	NA	1986
Pakistan	NA	2001
Panama	NA	1996
Poland	NA	1990
Slovak Republic	NA	1991
Tajikistan	NA	1996
Tunisia	NA	1989
South Africa	NA	1991