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External influences on economic reform: Reform as a regional public good

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Abstract

We study a game between a group of rich country investors and a group of developing countries. Countries adopt policy reform to raise the return to and try to attract foreign investment. We focus on the interaction between investors' incentives to acquire country-specific information on the incidence of reform and countries' incentives to undertake reform. Uninformed investors may still invest in the region based on a costless signal of the regional average return. In this case, reform is a regional public good. We show that equilibria exist with no investment and no reform, with partial reform and blanket investment by uninformed investors, and with partial reform and targeted investment by informed investors. However, it is almost impossible to sustain complete reform as an equilibrium.

JEL classification: C72; H41
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1. Introduction

Many countries have delayed or failed to implement reforms that have payoffs sufficient to compensate any losers. A large literature has examined the political economy of reform. To date, the existing literature has concentrated exclusively on how internal factors can delay or prevent reforms. In this paper, we take a new direction and model reform as a regional public good.

Our argument is simple. We assume that increased foreign investment comprises an important expected benefit from reform. Under plausible conditions, reform in one country can spill over

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into increased investment in another, possibly unreformed, country in the region. We model the interaction between initially un-reformed, developing countries and initially non-discriminating, rich country investors. Countries decide whether to undertake costly reforms that raise the return to foreign investors and may attract valuable foreign investment. Foreign investors initially view a number of countries as belonging to a single homogeneous group. Investors can pay to acquire country-specific information concerning the incidence of reform, or remain uninformed and observe the average return to investing in the region (which is a function of the number of reformed countries). Reform by any one country in the group creates a positive spillover for all its co-members through the average return. If all investors are informed, and accurately distinguish each individual country, reform will not have these spillover effects. A country's reform decision thus depends on foreign investor information costs and the reform plans of the other countries in one's pool, in addition to the already widely studied internal factors.[1]

The model highlights the external, strategic dimension of the reform decision that does not appear in the existing literature. In order to isolate the effects of this potential spillover, we keep the rest of the model simple. We assume that all countries face the same cost of reforming and that all rich country investors are identical. Yet we are able to generate a rich set of results with real world implications from this basic model. Perfectly informed investors and complete reform, for example, cannot co-exist in equilibrium because pervasive reform eliminates the value of country-specific information. An equilibrium with all uninformed investors and no reformed countries can exist due to the public good aspect of reform even when reform would attract substantial foreign investment. Further, equilibria exist where some countries reform and others do not, yet uninformed investors put money into all the countries in the region. This type of equilibrium, where different countries are treated the same by foreign investors, is consistent with the complaints often heard from politicians during crisis episodes, that their country is paying for the transgressions of a neighbor. We also find that multiple equilibria arise, due to a persistent coordination problem among countries.

The paper is organized as follows. Section 2 reviews some of the main existing literature on delay in policy reform, along with other papers that have aspects in common with our approach. Section 3 sets out the model describing the players, their strategy sets, and payoffs. Section 4 presents a detailed example and discusses the main results. Section 5 describes several useful possible extensions of the model and Section 6 presents the conclusions.

2. Literature

The literature on reform and the delay of reform is extremely large.[2] Here we review some recent and related work. Alesina and Drazen (1991) and Drazen and Grilli (1993) model delayed reform as the result of a war of attrition over the distribution of the costs of reform.[3] Fernandez and Rodrik (1991) attribute non-reform to a status-quo bias arising from uncertainty about the benefits of proposed reforms. Kuran (1987) argues that policy persistence and delayed reform result from preference falsification. Orphanides (1992) and Leitzel and Weisman (1999) argue that the delay of reform comes from optimal waiting. Chang (2001) models delay in reform as stemming from the

[1] We do not see our model as a substitute for the reform motivations given in the existing literature, but rather as a complementary analysis that concentrates on a different source of delay.

[2] See Drazen (2000, chapter 10) and Rodrik (1996) for surveys of the literature.

[3] Casella and Eichengreen (1996) extend the war of attrition model by studying how the possibility of attracting conditional foreign aid can affect the adoption of reforms.

Table 1
Summary of Notation

Domestic cost of reform in country *j*:	$^{*}j$	
Cost of acquiring country-specific information by investor *i*:		Ci
Rate of return in a reformed country		H
Rate of return in an unreformed country		L
Rate of return in the rich country		S
Number of countries that choose reform		R
Average return in region		2
Number of investors that purchase information:		B
Potential investment level of each investor *i*:		Ti
Total investment pool:	T	

government's need to improve its reputation sufficiently to make the reform credible when implemented. Finally, Tornell (1998) provides a unique perspective on reform, modelling it as a costly pre-emptive strike by one elite group in a society against other elite groups.

The existing literature does not consider strategic interaction among neighboring countries as an explanation for the delay of reform. Our contribution consists of examining the implications of spillovers for the reform process. In our model, reform might not occur either because foreign investors are expected to not notice, or because reforms in neighboring countries have already attracted foreign investment.

Recent papers outside the delayed reform literature also relate to our work.[4] Levine and Martinelli (1998) discuss the choice by a single country to adopt good or bad institutions when faced with a continuous stream of potential foreign investors who cannot perfectly observe the country's choice. Tirole (1996) models the existence, maintenance and duration of a collective reputation, where the actions of one member affect the reputation of all the group members. Calvo and Mendoza (2000) study how the decision of investors to pay for country-specific information changes as the number of countries in which to invest increases. Our model is similar in some respects to each of these papers. We assume that a fixed number of countries decide whether to reform and that investors cannot easily observe whether a country reforms, yet pay for perfect country-specific information. When investors do not purchase this information, investors treat the individual countries as a homogenous group and thus the countries have a collective reputation.

3. Model

There are M developing countries in a regional group, indexed $j=1\ldots M$, and N rich country investors, indexed $i=1\ldots\ldots N$. Developing countries value foreign investment and undertake reform to attract foreign investment by raising the rate of return on investment projects in the country.[5] Rich country investors find projects in a reformed country attractive relative to the safe return from home country investments but prefer the rich country return to investing in an unreformed country. Investors decide to either acquire costly country-specific information about the occurrence of reform or simply base decisions on the expected average return on investment in the region. Based on the information they acquire, investors allocate their funds to one or more countries in the region or invest at home. Table 1 summarizes the notation used in the paper.

[4] There is also a literature on the optimal sequencing of reforms that we do not consider here.

[5] The type of reforms considered in the literature (increased open-ness, commitment to the rule of law, reduction in corruption, etc.) are generally reforms that raise the return to investment.

3.1. Countries

Each country makes one choice in the game, to reform or not. We do not model the political process behind the reform decision, but simply assume it to be made by the incumbent government (of whatever type). The incumbent regime does not value reform directly, but rather the foreign investment reform may attract.[6] Developing country governments clearly value foreign investment. Rodrik (2001) writes, "foreign trade and investment have become the ultimate yardsticks for evaluating the social and economic policies of governments in developing countries. Just mention 'investor sentiment'… and policymakers will come to attention in a hurry".

Reform is a discrete action; that is, we do not allow partial reform. Let r_j be the probability that country j reforms. We first consider only pure strategies, $r_j = \{0, 1\}$, and in this case let $R = 3\ r_j$ be the number of countries in the region that reform. Let the total amount of funds available to rich country investors be T, and let T_j be the amount of foreign investment in j. The government of country j receives utility from this investment of $U_j(T_j) = T_j$ for all j. Let the cost of reform be $* > 0$, which we assume is the same for all countries and known by investors. A regime compares its expected marginal utility of reform with the cost *. We assume that any country would reform if it could capture all the potential foreign investment, $T - * > 0$, but that internal benefits alone are insufficient to motivate the regime to initiate reform.[7] An unreformed country can receive investment funds if some investors do not purchase country-specific information and enough other countries reform.

3.2. Investors

Investors are risk neutral and each has an equal share of wealth, T/N.[8] The investor can invest in one or more of the countries in the region or invest at home, and allocates his or her portfolio to maximize the expected return. The average rate of return in a reformed country is H while the average return in an unreformed country is L. The safe rate of return from investing in the rich country is S. A natural assumption is $H > S > L$. The return on investment in country j depends only on the occurrence of reform in country j, so investment in strict terms is not a public good for the region. The publicness occurs because reform by any country raises the average rate of return in the region and some investors may base their decisions on the level of the average return.

[6] This valuation can be for any one of several reasons: the resulting increased capital stock, faster economic growth and development, or tax revenue. We are thus considering the costs and benefits of reform for the country's regime, which may be unrepresentative of societal benefits. We do this to concentrate on the novel part of our model, how the interaction of investor information and other countries reform plans affect incentives for reform.

[7] We do not require that the incumbent government discounts domestic welfare. Reform might require complementary foreign investment. For example, internal educational reform might require increased foreign investment in order to pay off. Bartolini and Drazen (1997a,b) consider a related model where countries make a discrete decision to reform. In their model, all countries initially liberalize their capital accounts and investors know this, but countries might reimpose controls at a future date and investors do not observe the value to the regime of capital tax revenue (their commitment to liberalization).

[8] We are thus implicitly assuming a borrowing constraint binds these investors. This assumption of borrowing constraints is relatively common in the literature, where it can often help to resolve empirical puzzles. For recent examples see, Vila and Zariphopoulou (1997), Constantinides, Donladson and Mehra (1998), Leung (2000) and Biederman (2000). Zhang (1997) studies the endogenous determination borrowing constraints. Risk averse investors would only slightly modify our model and not substantially affect the results. Uninformed investors invest in an index fund that is already diversified across countries and earns the average return in the region. Risk aversion would reduce investors' willingness to purchase country-specific information.

Specific information about a country's reform status is costly. That is to say, investors cannot easily observe whether a country has actually reformed. No head of state is likely to publicly announce, "our government and economy is protectionist, backward and corrupt." Countries that do not plan to reform can at minimal cost adopt the outward trappings of reform: appoint ministers with the proper titles, pass legislation or issue decrees that appear to affect reform. Investors must incur costs to go beyond this facade and learn which countries in a group have actually undertaken reform.

We assume that investors can either purchase country-specific information or simply observe the expected average return on investment in the region.[9] Uninformed investment can be thought of as buying an index fund that passively invests in all the countries in the region and does not charge a fee. In contrast, informed investment can be thought of as buying an actively managed fund that undertakes costly research and invests only in the reformed countries, but charges a percentage fee.[10] We call investors who purchase country-specific information *discriminating* investors and those who do not *pooling* investors. Let C be the cost to an investor of acquiring this information, and let B be the number of discriminating investors. All pooling investors learn the expected average return to investing in the region $2=[RH+(M-R)L]/M$, and treat all countries in the region alike.

Investors' allocation of funds based upon the information they receive is straightforward. Discriminating investors invest in the region if $R>0$, and invest at home if no countries reform. Pooling investors compare the expected average return 2 and the safe return, S, investing in the region if $2\exists S$. Assume pooling (discriminating) investors divide their funds equally among all countries (all reformed countries) if they invest in the region. Investors' decision to become informed depends on the number of countries they believe will reform and the cost of information. If the cost of information is sufficiently high, $C>H-S$, investors will never purchase information.

3.3. Order of play

We consider a one shot reform and investment game. Reform and investment decisions are simultaneous, and thus uninformed investors cannot free ride on the actions of informed investors.[11] The sequence of actions is as follows:

1. Countries simultaneously decide whether to reform, and investors (without observing the reform decisions) simultaneously decide whether acquire costly information about the incidence of reform in each country.

[9] Calvo and Mendoza (2000) consider a model in which investors can acquire a different type of country specific information, namely information that might debunk or confirm a credible rumor regarding the rate of return on investment in the country.

[10] Note that both country specific and region-wide mutual funds exist. A search of Fidelity Investments "Funds Network", a list of over 4000 open-ended mutual funds, shows over 20 Southeast Asian equity funds, 7 Latin American funds, one Middle Eastern fund and one African fund. There are individual country funds only for China, Mexico, and Korea. A cursory inspection of closed-end mutual funds shows that while both types of funds exist, the balance is tilted toward individual country funds. For example, there are closed end funds for Argentina, Brazil, Chile and Mexico and only two regional Latin American closed end funds. This finding is consistent with the idea that uninformed investors are more likely to pool via buying open-ended funds and informed investors more likely to target via trading closed end funds.

[11] We assume that country-specific reports on economic reform are private information. Often this is the type of research which gets reflected in prices and which Grossman and Stiglitz (1980) argue investors do not have an incentive to undertake in equilibrium. Uninformed investors cannot free ride off the costly research of discriminating investors here because of the one-shot nature of the game and the simultaneous allocation of funds by all investors. If the average return on investment in reformed countries decreases with the volume of funds invested in the country ($H(T_j)$ with $H'<0$), informed investors have an incentive to disguise their actions. Hence simultaneous moves by investors might be a reasonable assumption in a one shot game.

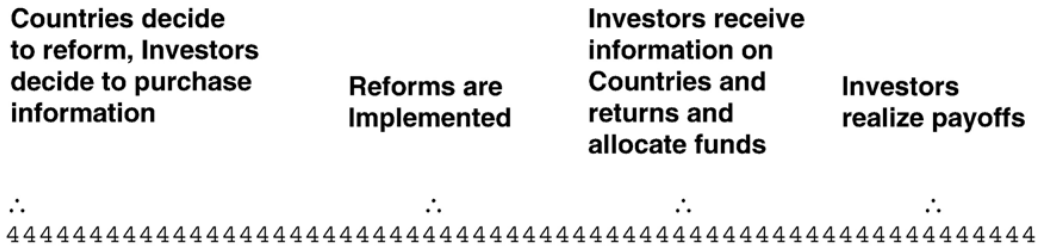

Fig. 1. Timing of Actions.

2. Reforms are implemented and investors receive their information about reform; pooling investors observe 2 while informed investors learn the exact identity of the reformed countries.
3. Investors simultaneously allocate their funds.
4. Countries and investors realize their payoffs.

Fig. 1 displays a schematic representation of the order of play.

4. Equilibrium

We examine in this section the effects of strategic interaction between investors and countries and solve for the Nash equilibria of the model. We focus on the effect that information concerning reforms has on the prospects for reform and how the regional public good effect of pooling investors can block reform in our model. We consider the case where the cost of information is low enough that investors might possibly become informed, $H-C \exists S$.[12] After considering investors and country payoffs, we solve for pure strategy equilibria and then the symmetric mixed strategy equilibrium.

4.1. Investor payoffs

We begin with investors' decisions. Fig. 2 displays the payoffs for discriminating and pooling investors as a function of the number of reformed countries, R. Discriminating investors receive $H-C$ if $R>0$ and $S-C$ if $R=0$, and so will invest in the region if any countries reform. The average return in the region rises steadily as countries reform from L when $R=0$ to H when $R=M$. Pooling investors earn S or 2, whichever is higher. Let R^p be the value of R that equates 2 to S,

$$R^p = M \cong (S-L)/(H-L) \tag{1}$$

R^p is the minimum number of countries that must reform to induce pooling investors to invest in the region. Comparison of the returns for pooling and discriminating investors demonstrate that investors will not become informed when either $R=0$ or $R=M$. The first case is intuitive and corresponds to a lack of profitable investments to make information worth the cost. The second case is less intuitive. Information though is equally valueless though when all countries reform because uninformed investors cannot make a mistake and earn H by investing in the region, while informed investors earn only $H-C$. Investors will pay for information only with partial reform.

[12] Clearly a managed fund would not charge a fee that priced itself out of the market.

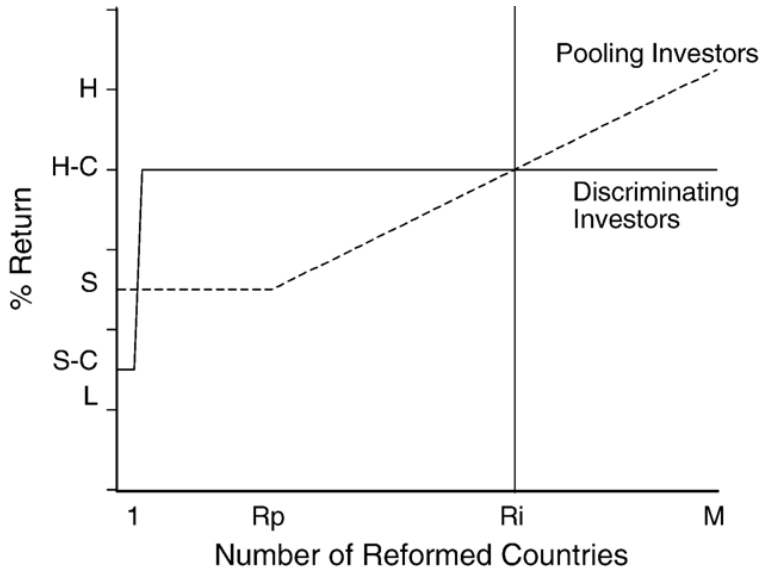

Fig. 2. Rates of return and reforming countries.

The maximum number of countries that can reform without undermining the incentive of investors to pay for information equates the average payoff 2 with $H-C$. Let R^i be the value of R which equates 2 with $H-C$,

$$R^i = M \cong (H-L-C)/(H-L) \tag{2}$$

R^i is the maximum number of countries that can reform without eliminating investors' incentive to become informed. The cost of information and the safe rate of return affect investors' incentive to become informed. An increase in the safe rate of return raises R^p and increases the incidence of reform needed to attract pooling investment to the region. An increase in the cost of information reduces R^i and makes pooling more likely.[13]

4.2. Country payoffs

Country j's payoff from reform depends on the amount of investment j can attract with and without reforming, and this depends on the number of informed investors B, the number of countries besides j that reform, R_{-j}, and whether uninformed investors invest in the region, $2>S$. Country j's payoff if it reforms is

$$B \cong T/[N \cong (R_{-j}+1)] + (N-B) \cong T/(N \cong M) -^* j \qquad \text{if } 2>S, \tag{3a}$$

$$B \cong T/[N \cong (R_{-j}+1)] -^* j \qquad \text{if } 2<S. \tag{3b}$$

[13] The incentive for investors to purchase country-specific information declines in Calvo and Mendoza (2000) due to an increase in the size of the market (the number of countries) that reduces the variance of investors' portfolios.

The payoff for country j if it does not reform is

$$(N-B) \cong T/(N \cong M) \qquad \text{if } 2>S, \tag{4a}$$

$$0 \qquad \text{if } 2<S. \tag{4b}$$

Country j receives funds from discriminating investors, $B \cong T/N$, only by reforming. All countries in the region share pooling investors' funds when the average return signal is favorable, $2 \exists S$. Pooling investors' funds create the public good aspect of reform. Reform does not create spillover benefits for investment in the model; that is, reform in j does not make investment more productive in country k. Countries reform if the value of the funds they gain from reform exceeds the cost. Unreformed countries can free ride on the reform efforts of other countries when enough other countries reform to induce pooling investors to invest in the region.

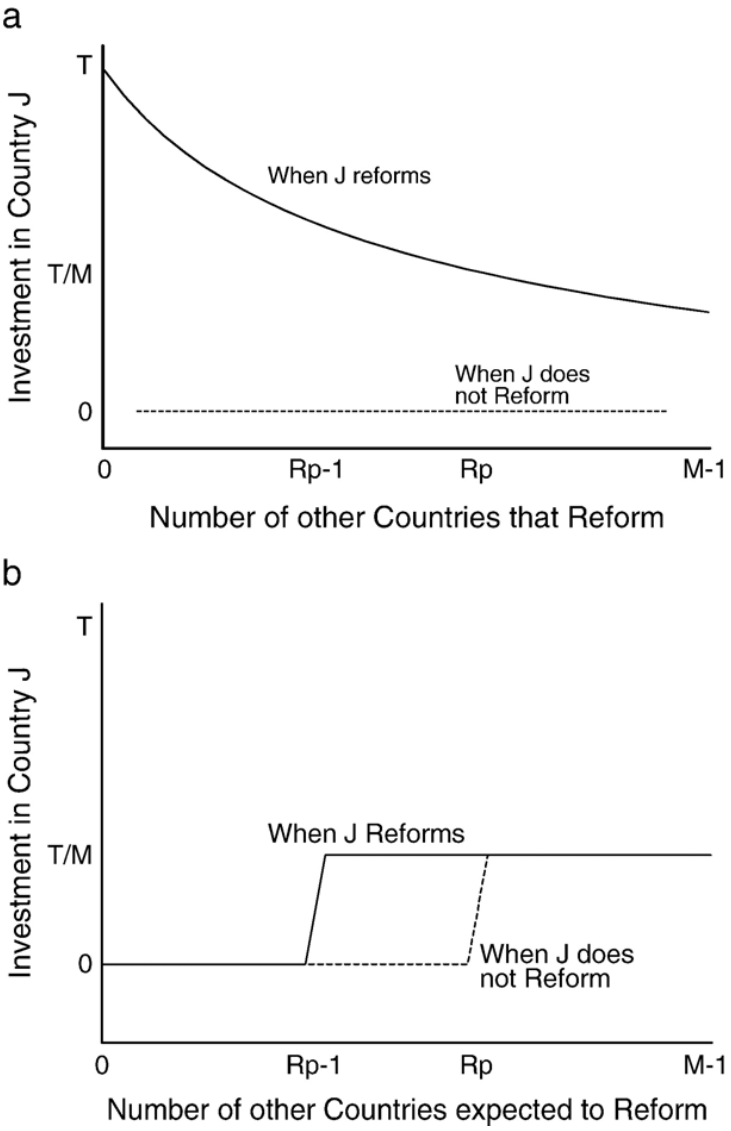

Fig. 3. (a) Return to reform in j given other countries' actions and discriminating investors. (b) Return to reform in j given other countries' actions and pooling investors.

Table 2
Pure strategy Nash equilibria

Equilibrium	Conditions
$R=0$, $B=0$	$R^p>1$ or $T/M<*$
$R=\text{int}(T/*)-1$, $B=N$	$\text{int}(T/*)-1 \# R^i$
$R=\text{int}(R^p)$, $B=0$	$\text{int}(R^p)$ $\exists R^i$, $T/M\exists *$

Fig. 3 displays investment in country j as a function of the number of countries besides j that reform, R_{-j}. Panel a shows the case of all informed investors while panel b displays the all-pooling investors case. Informed investors provide country j with a strong incentive to reform because j can receive investment only by reforming, but the incentive to reform diminishes as the number of other reformed countries increases. All uninformed investors provide a weak incentive for reform. Reform does not increase the amount of investment country j receives except when j's reform induces pooling investors to invest in the region, which is depicted in the interval $(R^p-1,\ R^p)$ in Fig. 3b. Countries have an incentive to free ride on the reforms of others with pooling investors. Country j will reform if all investors pool if j expects to be decisive in inducing investment, that is, if R_{-j} 0 $(R^p-1,\ R^p)$, and an equal share of investment is worth the cost of reform, $T/M-*\exists 0$. Only the minimum number of countries needed to induce investment will reform in an equilibrium with all-pooling investors.

The value of R^p allows us to distinguish two potential problems for reform in the region. If $R^p>1$, no country can make the average rate of return high enough to induce investment by unilateral reform. At least two or more countries must reform for pooling investors to invest; in this case countries in the region face a *coordination problem* in the face of pooling investors. If $R^p+1 \# M$, the number of countries needed to induce investment from pooling investors is less than the entire region and countries in the region face a *free riding problem* in this case. If reform in two out of three countries produces a $2\exists S$, each of the three countries would each like to be the one to avoid and free ride on the efforts of others. Both the coordination and free riding problems can delay reform in the region.[14]

4.3. Pure strategy equilibria

Table 2 presents all the pure strategy Nash equilibria and the conditions for each set of strategies to comprise an equilibrium. Three types of Nash equilibria are possible. (1) *No reform, no investment*. If no countries reform, investors will not pay for information, as illustrated by Fig. 2. This equilibrium exists as long as no country wants to reform when all investors are uninformed and no other country reforms. Satisfaction of one of two conditions ensures the existence of this equilibrium. The first is that reform by one country does not generate a sufficiently high average regional return to induce pooling investors to invest, $R^p>1$. Coordination failure can prevent provision of the regional public good of reform when $R^p>1$. Alternatively a no reform, no investment equilibrium exists even if $R^p \# 1$ if no country wants to reform for an equal share of regional investment, $T/M<*$. In this case, no country will provide the public good because they must bear the full cost while only receiving $1/M$ of the benefits. A

[14] The coordination aspect of reform identified here could form the basis of a regional war of attrition as countries wait for others to stop forward and provide the regional public good. The war of attrition model has previously been applied only within countries.

no reform, no investment equilibrium is not Pareto optimal, because it is Pareto dominated by all informed investors and one country reforming.

(2) *All informed investors, partial reform*. Equilibrium is possible with all informed investors only if the number of reforming countries does not exceed R^i. The number of countries that want to reform when all investors discriminate is $T/*$, so the condition for the existence of this equilibrium is $T/* \# R^i$. The incidence of reform across the region does not depend on the cost of reform; the lagging countries here do not have higher costs of reform. An equilibrium of this type, if it exists, is Pareto optimal.

(3) *All investors pool, some countries reform.* An equilibrium is possible with all uninformed investors and investment in the region. Reform is a public good with pooling investors, so only the number of countries needed to attract investment will reform, that is, the smallest number of countries that exceeds R^p. Two conditions must hold for an equilibrium of this type. First, the investors must not wish to purchase country-specific information when R^p countries reform. Comparison of (1) and (2) reveals that $R^i > R^p$ when $H - C > S$; this condition requires that the smallest integer greater than or equal to R^p must be greater than R^i. Second, countries must be willing to provide the public good for a share of the regional investment, $T/M \exists *$. An equilibrium of this type, if it exists, is Pareto optimal.

4.4. Mixed strategy equilibrium

A symmetric strategy equilibrium exists where all countries reform with positive probability $r*$. To solve for this equilibrium, we must find the probability of reform which makes investors indifferent ex ante between purchasing information and pooling and then determining the fraction of informed investors that make countries indifferent about reforming. Informed investors earn a payoff of H as long as at least one country reforms. The probability that none of the M countries in the region reforms when each country reforms with probability r is $(1-r)^M$, and the expected payoff for informed investors is $(1-r)^M \cong S + [1-(1-r)^M] \cong H - C$. The expected return for pooling investors is $r \cong H + (1-r) \cong L$, assuming $2 > S$. The probability of reform that makes investors indifferent ex ante about purchasing information, $r*$, is defined implicitly by

$$(1-r^*)^M \cong (S-H) + (1-r^*) \cong (L-H) + H - C - L = 0. \tag{5}$$

For $r*$ to be an equilibrium, each country must be indifferent about reforming when all other countries reform with probability $r*$. Let the fraction of investors who purchase information be $\exists$. Country j expects $r^* \cong (M-1)$ other countries to reform in the proposed equilibrium and will be indifferent if

$$\exists \cong T/[r^* \cong (M-1) + 1] = *,$$

which yields an equilibrium value of $\exists$ of

$$\exists^* = * \cong [r^* \cong (M-1) + 1]/T. \tag{6}$$

The mixed strategy equilibrium yields comparative statics results concerning the effect of changes in the parameters of the model on the probability of reform. An increase in the rate of return in reformed countries and an increase in the safe rate of return both increase the equilibrium probability of reform, $*r^*/*H > 0$ and $*r^*/*S > 0$. Although an increase in H raises the payoffs of

both discriminating and pooling investors, the payoff for discriminating investors increases more, making investors willing to purchase information with a higher probability of reform. An increase in the cost of information or the unreformed country rate of return reduce the probability of reform, $*r^*/*C<0$, $*r^*/*L<0$. An increase in the number of countries in the region increases the payoff for discriminating investors by reducing the probability that no countries in the region reform, and thus raises the probability of reform, $*r^*/*M>0$. Note that the cost of reform and total investment funds available do not affect the probability of reform. In the mixed strategy equilibrium, countries must remain indifferent about reform, so an increase in T must be offset by a reduction in $\exists$, $*\exists^*/*T<0$, so as not to change the countries' payoff from reforming. Improved economic conditions in the developed countries which raises S makes reform more likely, while a larger (or smaller) pool of investment funds paradoxically does not make reform more likely.

5. Discussion

Several insights about reform emerge from the model. First, fully informed investors and universal reform is not an equilibrium. While discriminating investors provide countries with the maximum incentive to reform, universal reform undermines investors' incentive to become informed. Full reform and informed investors is not Pareto optimal, since it is dominated by full reform and pooling investors.

Second, multiple equilibria are possible, specifically the no reform–no investment equilibrium and one equilibrium with reform. A coordination failure may prevent reform throughout a region. The no reform–no investment equilibrium breaks down when $R^p \# 1$, because a single country's reform is sufficient to induce investment in the entire region. A smaller value of S reduces R^p meaning that a paucity of good investment opportunities in rich countries mitigates the collective action problem in currently poor (unreformed) regions.[15]

Third, universal reform is difficult to sustain as an equilibrium. Universal reform requires uninformed investors, but then foreign investment is a public good, and free riding prevents reform by all countries unless universal reform is necessary to attract pooling investment, $R^p > M-1$. Examination of (1) reveals that this occurs only when the safe rate of return is relatively high, $S>H$. Consequently a high rate of return with reform in the region or a low rate of return in rich countries makes full reform less likely. A high rate of return in rich countries is needed to make universal reform an equilibrium, but this exacerbates the region's coordination problem.

Furthermore, a larger pool of investment funds does little to encourage reform in our model. Clearly if sufficiently little foreign investment is available, $T<*$, there is no reform. But a sufficiently large pool T cannot sustain an equilibrium in which all countries in the region reform. With all informed investors, once the pool of funds becomes large enough that all countries reform, $T/M>*$, investors' incentive to purchase information is compromised. Some countries must remain unreformed in equilibrium to provide some investors an incentive to become informed, and the total amount of funds controlled by informed investors cannot increase. An increase in funds beyond this point simply increases the proportion of uninformed investors. More foreign investment cannot produce full reform in our model.

Finally, we have assumed that country-specific information is potentially valuable. If the cost of information is sufficiently high that $H-C<S$ (perhaps because outsiders cannot determine

[15] In Bartolini and Drazen (1997b) a low world interest rate induces countries to liberalize their capital accounts. Here a low interest rate has offsetting effects on reform, making no reform–no investment less likely to be an equilibrium, but also making full reform unlikely.

which reforms are genuine), reform is exclusively a public good. The existence of an equilibrium with R^p reforming countries is more likely due to elimination of the possibility of investors purchasing country-specific information when R^p countries reform (recall that $R^p < R^i$).[16]

The international spillover effect of reform modeled here can help explain some puzzling cross country behavior that is not currently addressed in the existing delay of reform literature, such as entire regions (eg. Sub-Saharan Africa) that largely fail to produce reform.[17] If countries expect that investors are pooling, then reform is a public good that must be provided by a substantial number of countries in order to attract investment, if the region is large. That is to say, it becomes harder to agree on the voluntary provision of a public good as the number of actors increases.[18] Our model captures this effect in the no reform–no investment equilibria.

Finally, with the benefit of hindsight, we can identify regions where some countries reformed and others did not, yet all the countries received increased foreign investment. Latin America in the 1980's and Southeast Asia in the 1990's are cases in point.[19] Our model is again consistent with this apparently puzzling behavior in that there exists a range of equilibria with partial reform and pooling investors.

6. Conclusions

Existing models of delayed reform are inward looking. In contrast we study an international dimension of delay, showing in a simple model how, if foreign investment is the prize from reforming, uninformed potential investors make reform in a region a public good. From this insight, it is but a short step to our results that the public good (reform) can be systematically undersupplied. In our model, there are no reform, no investment equilibria, investment with partial reform equilibria (with either informed or uninformed investors), but absent one very special case, no equilibria with full reform.

Our model is simple and can be extended in several interesting directions, which we only mention here. We have assumed that all countries receive an equal share of the region's investment funds. However, a particularly large country in the region may receive more than a proportional share of investment, and (assuming a constant cost of reform) large countries have a greater incentive to reform. We have also assumed that all countries face the same cost of reforming. An asymmetric cost of reform affects the model in several ways. Most particularly, the presence of some countries with a high cost of reform makes an equilibrium with all informed investors more likely. If $M - R^i$ countries have a prohibitively high cost of reform, country-specific information remains valuable to investors even with a large pool of investment funds. The

[16] Note also that a large pool of investment funds, T, prevents an equilibrium with informed investors. Intuitively one might expect a large pool of potential investment to provide a strong incentive for universal reform. But this is not the case. The willingness of all countries to reform with all informed investors eliminates the need for investors to purchase information, and this allows countries to secure funds from pooling investors without reforming. The cost of information, C, also affects the likelihood of equilibrium with all informed investors. A lower cost of information increases R^i and makes $T/* < R^i$ more likely.

[17] While it may be possible to modify traditional reform models to explain the clustering of unreformed countries, our model provides a natural explanation.

[18] It is worth noting that in Fidelity's list of 4100 mutual funds, there are no country specific funds for Africa and only 1 regional fund. There are no single African country closed end funds either.

[19] It is not an easy task to say conclusively who really reformed and who did not. Yet it does seem clear looking back that strong Chilean reform may have spurred region-wide foreign investment in Latin America, and reform in Taiwan and Korea may have done the same in Southeast Asia, even though some of the countries in each region had not enacted meaningful reform.

presence of one or several countries with a low cost of reform also makes the provision of the public good of regional reform more likely when the collective action required is modest (R^p is small). On the other hand, a few countries with a high cost of information makes reform less likely when near universal reform is needed to get pooling investors to invest in the region.

Since countries reform to attract foreign investment and investors wish to invest in countries that have undertaken reform, a signaling game is an alternative way to model the interaction between countries and investors, as in Bartolini and Drazen (1997a,b). We have assumed that no suitable method exists for countries to signal that they have reformed. The trappings of reform are not costly enough to ever create a separating equilibrium. If a suitable signal existed to sustain a separating equilibrium, foreign investors should never be surprised to discover that a country everyone though had reformed had failed to do so. Examples of such surprises support our assumption that investors must undertake costly research to determine which reforms are genuine.

We have modeled the reform — investment process as a one shot game, which contributes to the publicness of reform. Over a longer time horizon, small initial investments could seemingly be used to identify countries which have reformed and direct future foreign investment, undermining the no reform–no investment equilibrium. A multi-stage or repeated game treatment is beyond the scope of this paper, but foreign investors may not be able to discover reformed countries in this manner. Reform is never permanent, so in a repeated game setting a country that reforms in the first stage could always abandon reform in the future, as in Bartolini and Drazen (1997b). Another factor is the duration of the investments in question. Even if policy is relatively persistent, the investments in question may require several years to produce their returns. As long as reform can be reversed at approximately the same interval as the investment, our one shot model could easily be the stage game of a repeated game.[20]

Uninformed investors in our model can simply observe the average productivity of investment in the region, 2, but an extension could allow uninformed investors to receive a stochastic signal of average return. A stochastic signal could lead to regret on the part of investors and countries. Investors may obtain less than the safe return, and countries might incur the costs of reform and receive no investment. A stochastic signal of return combined with a multi-period game could produce a model with contagion. Pooling investors in our model are treating substantively different countries identically when putting their money into a region, which is the fundamental element of contagion. A dynamic extension of our model of reform and investment would address specifically the possibility of investors treating different countries identically when deciding whether to take money out of a regime.

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[20] Provided that the cost of continuing reform did not vary much from the cost of initiating reform. But our assumption of an equal cost of reform for all countries was only for convenience and could be relaxed as discussed above.

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