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Economic divergence and institutional change: some observations on the convergence literature ☆

Peter Skott *

Department of Economics, University of Aarhus, 8000 Aarhus C, Denmark

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Abstract

Poor economic performance in a country will often lead to changes in the domestic policies and institutions, political instability, or changes in international relations. Induced institutional change of this kind affects the interpretation of the empirical evidence on economic convergence: a divergent process may be stabilized by institutional and political intervention. Stabilization may result even if the effects of each intervention are stochastic and the expected value of the benefits from each reform is non-positive. Thus, the appearance of conditional convergence may carry no implications for 'the underlying parameters of technology and preferences.' ©1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

Increasing economic inequalities tend to produce conflict and political tension as groups who see their relative position deteriorate try to change the rules of the game. The pressures to change the socio-economic system sometimes take the form of violent political uprisings and revolutions, but gradual reform may be a more important source of endogenous rule change.

☆ This paper was written while I was Visiting Professor at the University of Notre Dame. Early versions of the paper have been presented in workshops and seminars at the universities of Bielefeld, Aarhus, Notre Dame and Vermont.

* E-mail: pskott@econ.au.dk

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In a spatial dimension, divergent per capita incomes can lead to migration. Internationally, however, this possibility is severely circumscribed, and international polarization has a range of other effects. These effects include changes in the domestic policies and institutions of slow-growing nations (e.g. export subsidies, industrial policies, labour market reforms), political instability (e.g. frequent changes of government, coups, industrial conflict) and changes in international relations (e.g. exchange rate and trading regimes, capital mobility, foreign military intervention).

Induced changes of this kind are likely for several reasons. The *relative* economic performance of a country, first, is considered intrinsically important by many people (if for no other reason than that international political influence depends on relative economic strength). [1] But even if this were not the case and people cared only about their own absolute performance, relative performance would still be important. In the absence of complete information about the effects of different policies, policy making involves a strong element of learning and institutional imitation. The promulgation by IMF and the World Bank of macroeconomic stabilization and structural adjustment programmes is justified by these organisations precisely by the claim that such institutional and political changes have been shown to improve economic performance. Other advisers promote policy packages involving very different elements, but also claim that their recommendations are supported by both theoretical models and empirical evidence from the experience of other economies. In fact, in the absence of perfect knowledge it is difficult to see how the performance of an economy could be judged if not through comparison with other economies.

While economic performance influences institutional change, the existence of a reverse chain of causation from institutions and political events to performance should also be non-controversial. Disruptions due to war or industrial conflict are obvious examples but, say, the choice of trading regime or the structure of education can also have profound effects on economic performance. Thus, there is a two-way interaction between relative economic performance and institutional and political events. Needless to say, this is not a closed, mechanical system. Not all political and institutional changes are induced by economic performance, and some political and institutional events have negligible economic effects.

South Korea, which has figured prominently in recent work on economic growth, is an interesting example. In the 1950s most observers considered the country a 'basket case.' Tradition-ridden, saddled with inefficient agriculture and a rent-seeking industrial sector, Korea seemed one of the least promising candidates for fast development. The drastic turnaround was sparked by political and institutional changes. Poor economic performance and the realization that economic strength is a pre-condition for political and military power led to increasing dissatisfaction among key groups, both civilian and military. Following the coup in 1961, economic growth was given top priority by the Park government. The policy package included specific export targets for individual sectors and firms, frequently adjusted subsidy structures, and preferential credit allocation to favored sectors. Disagree-

[1] Asked by Robert Reich to choose between two scenarios, one with both US and Japan growing at 1 percent and the other having US growing at 2 percent but Japan at 3 percent, a clear majority of Harvard students apparently preferred the slow growth option (Economist, 1 October 1994; Survey: The World Economy, p. 10). Although often ignored by economists, the empirical evidence for interdependent utility functions at the micro level is very strong (see e.g. Lane, 1991).

ments remain over the identification of the critical elements in the Korean turnaround but the importance of the combined 'Park shock' is non-controversial.

The Meiji restoration in Japan is an earlier parallel to the Korean case. On a smaller scale, relative economic decline has been a constant concern to U.K. policy makers throughout most of the post-war period, and a number of policy changes and institutional innovations have been at least in part directed towards this problem. U.S. debates on trade issues, the merits of industrial policy and the role of the government in education and R&D can be seen in the same light. Japan and Korea are examples of successful institutional change; the experience of the UK shows that political and institutional changes do not always have the desired effects, a point illustrated also by failed reform attempts in many LDCs and centrally planned economies.

It is the purpose of this paper to explore some possible implications of the interaction between economic performance and political and institutional variables. Over the last 10–15 years there has been a resurgence of interest in the theory and empirics of economic growth. The theoretical literature analyses models in which the growth rate of an economy may be determined endogenously and in which per capita incomes may diverge across countries. However, there appears to be little or no recognition that divergent incomes lead to institutional upheaval and that the 'pure economic system' may never get to run its full course. This conceptual weakness affects the empirical literature, too. Numerous studies include institutional and political variables in order to explain differences in growth performance but with few exceptions (e.g. Perotti, 1996) these variables are treated as exogenous. The possibility of induced institutional and political change is implicitly excluded, and this exclusion may prejudice the standard interpretation of the empirical evidence. Thus, a divergent process may be stabilized by induced institutional and political intervention, and the appearance of conditional convergence may carry no implications for the 'underlying parameters of technology and preferences'.

2. Induced institutional change

The standard framework used by Barro and others leads to a dynamic equation of the following kind:

$$y_{it+1} = \gamma y^*_{it} + (1-\gamma) y_{it} + (y^*_{it+1} - y^*_{it}) + \epsilon_{it} \tag{1}$$

where $y_{it} = \log Y_{it}$ is the logarithm of per capita income in country i at time t, ϵ_{it} is a random disturbance term, and y^*_{it} describes the economy's steady-growth equilibrium path.

In a Ramsey–Solow model the equilibrium path y^*_{it} is determined by the parameters describing preferences and technology and by the rate of population growth, but it is generally accepted that the policies and institutions of a country may affect its equilibrium path. Hence, institutional change may cause a shift in y^*_{it} As a simple formalization of this, let [2]

[2] In Eq. (2) it is assumed that institutional structure determines the level of equilibrium income. A dependence of both the level and the equilibrium growth rate on institutional structure could be included by replacing the exogenous rate of technical progress in Eq. (2) (the parameter a) by a function $\phi_i(X_t)$. This extension of the argument will not be pursued in this paper.

$$y_{it}^{*} = a\,t + f_i(X_t) \tag{2}$$

where $a \geq 0$ represents exogenous technical progress (assumed identical for all countries), X_t is a vector of policies and institutional characteristics in all countries, and $f_i(.)$ describes the effects of these characteristics on equilibrium income in country i. [3]

Policies and institutions change over time. Some of these changes are autonomous and others may be facilitated by fast growth. Thus, crises are neither necessary nor sufficient for reform. In many cases, however, changes are induced by poor performance, and I shall focus on this last category of reform. Specifically, it is assumed that unsatisfactory performance leads to institutional reform and that the 'size' of the reform tends to be inversely related to the current level of performance: drastic reform measures become attractive if performance is poor. These assumptions, which as pointed out by Rodrik (1996, 26ff) are in line with many recent studies, have obvious affinities with satisficing models in the evolutionary tradition.

The effects of reform can be highly uncertain, but poor performers observe the superior performance of more successful countries and often attempt to emulate the institutions in these countries. It therefore seems plausible to assume that the expected value of the improvement in performance is determined by the magnitude of the reform shock and by the scope of improvement as measured by the difference between the equilibrium incomes in the imitating country and in the country whose institutions and policies are being imitated.

Taking income y as a measure of performance, these properties can be captured formally by the assumption that

$$\begin{aligned} E(y_{it+1}^{*} - y_{it}^{*}) &= a + E(f_i(X_{t+1})) - f_i(X_t) \\ &= H(y_t^{\max} - y_{it},\ (y_t^{\max})^{*} - y_{it}^{*},\ (y_t^{*})^{\max} - y_{it}^{*}) \end{aligned} \tag{3}$$

The first argument, $y_t^{\max} - y_{it}$ (i.e. income relative to the leading country), reflects the dependence of the size of reform on current relative performance and the influence of reform-size on expected improvement. The scope for improvement — the other determinant of expected improvement — is captured by the remaining two arguments. If a country imitates the policies of the country that currently has the highest income, the scope for improvement will be $(y_t^{\max})^{*} - y_{it}^{*}$; if instead the best-practice institutions are correctly identified, reforms will aim to emulate the country with the highest value of y^{*}, and the expected value of the improvement will depend on $((y_t^{*})^{\max} - y_{it}^{*})$. This distinction may be empirically important. Correcting for purchasing power, the US may have the highest per capita income, but (even if per capita income were the only criterion) it is not obvious that other countries should try to emulate U.S. institutions rather than, say, Japanese or European institutions. [4]

[3] Although equilibrium income in country i may depend primarily on the characteristics of the country itself, policies and institutions in other countries may also play a role; trade policy, say, in one country may affect income in another country. Skott and Sethi (1997) analyse the dynamic interaction between the distortionary industrial policies in a simple model with two economies.

[4] Additional complications arise from the multidimensional nature of the institutional and political structure. Thus, it may be desirable to combine institutions from different countries, and the variable $(y_t{}^{*})^{\max}$ could be interpreted as the steady-state output corresponding to the optimal mix of best-practice institutions from different countries.

Assuming that the H-function is linear (or adopting a linear approximation), Eq. (3) can be rewritten as:

$$E(y^*_{it+1} - y^*_{it}) = \lambda_0 + \lambda_1(y_t^{\max} - y_{it}) + \lambda_2(y_t^{\max *} - y^*_{it}) + \lambda_3(y_t^{*\max} - y^*_{it}) \quad (4)$$

Eq. (4) describes the expected value of the change in equilibrium income. The actual change in y^* is found by adding a stochastic disturbance term, μ, with mean zero:

$$y^*_{it+1} - y^*_{it} = \lambda_0 + \lambda_1(y_t^{\max} - y_{it}) + \lambda_2(y_t^{\max *} - y^*_{it}) + \lambda_3(y_t^{*\max} - y^*_{it}) + \mu_{it} \quad (5)$$

Using Eqs. (1) and (5) we get

$$\begin{aligned} y_{it+1} = {} & [\lambda_0 + \lambda_1 y_t^{\max} + \lambda_2 y_t^{\max *} + \lambda_3 y_t^{*\max} + (\gamma - \lambda_2 - \lambda_3) y^*_{it}] \\ & + (1 - \gamma - \lambda_1) y_{it} + \epsilon_{it} + \mu_{it} \end{aligned} \quad (6)$$

The expression in Eq. (6) has several important implications. It shows, first, that induced institutional change of this kind may exert a stabilizing influence. A simple Barro-regression of y_{it+1} on y_{it} will give a parameter estimate which reflects both technical aspects and the process of induced institutional change. Conditional β-convergence may result from a non-positive γ (implying tendencies for divergence in the absence of induced institutional change) and a positive λ_1 (the stabilizing effect of institutional change).[5] The point is not merely that institutional and political variables influence the steady growth path. The influence of a given institutional structure — a given value of the *X*-vector in Eq. (2) — can be captured by Barro-type regressions and in Eq. (6) appears as part of the term in square brackets. The standard interpretation of Barro-type regressions does not, however, allow for the possibility that the estimated speed of convergence may itself reflect induced changes in the institutional structure. It should be noted, second, that while the presence and speed of convergence depend only on γ and λ_1, the parameters λ_2 and λ_3 influence the equilibrium towards which the economy converges.

The effects of the λ parameters may be seen clearly by considering the special cases in which only one of λs is non-zero:

Case 1: $\lambda_1 = \lambda_2 = 0$, $\lambda_3 > 0$, $\gamma > 0$. This is a case of exogenous convergence to the right target: there is a 'diffusion' of *best-practice* institutions ($\lambda_3 > 0$, $\lambda_2 = 0$, $\gamma > 0$), and the rate of diffusion is *independent* of current relative performance ($\lambda_1 = 0$).

The first term in square brackets on the right hand side of Eq. (6) depends on y^*_{it} so the medium term displays conditional convergence. Note, however, that if $\gamma < \lambda_3$ the term in square brackets will depend negatively on y^*_{it}: a poor initial mix of institutions and policies stimulates growth through its effect on institutional change, and this effect may dominate the traditional mechanism relating growth to the initial difference between equilibrium and actual income. It should also be noted that the target term in square brackets includes international variables: convergence is to a target that depends on the determinants of $y_t^{*\max}$ as well as on the determinants of y^*_{it}. Note, finally, that in the very long run the specification implies unconditional convergence towards $y_t{}^{*\max}$ According to Eq. (5) $y_{it}{}^*$ β-converges

[5] It is assumed that λ_1 is positive. One may think of cases in which a country doing badly has responded by reforms that aggravate the problems. In terms of Eqs. (5) and (6) these cases would be represented by negative values of the disturbance term μ.

to $y_t^{*\max}$ when $\lambda_1 = \lambda_2 = 0$ and $\lambda_3 > 0$;[6] the term in square brackets therefore β-converges to $\lambda_0 + \gamma y_t^{*\max}$ and y_{it} β-converges to $y_t^{*\max}$.

Case 2: $\lambda_1 = \lambda_3 = 0$, $\lambda_2 > 0$, $\gamma > 0$. This case resembles Case 1, but with the important difference that convergence is to the *wrong* target. All economies — even the best-practice economy with the highest equilibrium income — imitate the institutions and policies of the economy that happens to have a highest *current* per capita income.

Cases 1 and 2 describe pure 'diffusion.' As a representation of induced institutional diffusion, however, these two cases have several shortcomings. They ignore, first, important questions of indivisibility and uncertainty. Decision makers may decide that there is a lot to be learned from, say, Nordic labour market institutions or Anglo-Saxon university systems. But the transplantation of these institutions is no simple matter, and there is always the danger that, even if successfully transplanted, the institutions may yield desirable outcomes only in the context of the broader social structure within which they evolved.

A second problem concerns the implicit assumption of symmetry. Diffusion may work if all that is required for a laggard to improve performance is the imitation of the policies or structures of successful nations. This, however, is a restrictive assumption. Symmetrical institutions and policies may lead to symmetrical outcomes if all other aspects of the economies are also symmetrical, but by assumption this is not the case: the initial position of the laggard differs from the initial position of the successful nation. Policy instruments need to be adapted to the task at hand, and in general the initial position will be important for the choice of instrument. Technologies used in the US or Western Europe may be inappropriate in LDCs; analogously, the institutions and policies of a high income nation may not benefit a low income country. As an example consider the case of trade liberalization. It is well-established that in the presence of increasing returns-to-scale free trade can exacerbate existing income inequalities. In these circumstances the imitation by the laggards of the free trade position advocated by successful countries can become a recipe for disaster. To overcome its initial disadvantage, a low-income country may have to adopt a different policy.[7]

These questionable aspects of 'diffusion' are avoided by Case 3 in which both of the 'diffusion parameters' λ_2 and λ_3 are set equal to zero:

[6] Eq. (5) implies that $E(y_{t+1}^{*\max} - y_{it+1}^*) = (1–\lambda_3)(y_t^{*\max} - y_{it}^*)$.

[7] One may also question the specification of the catching-up process. It was assumed above that poor countries imitate rich countries and that this imitation produces a positive catch-up effect. If, however, the steady growth rate is endogenous and if the institutional environment influences this growth rate, slow-growing nations should (assuming that they know the correct model describing the growth pattern) try to emulate the fast-growing nations rather than the currently rich nations. Furthermore, if the institutional structure determines the growth rate, the diffusion of best-practice institutions may lead to *growth rate* convergence. This, however, does not ensure convergence of the *levels* of per capita income. Assume that

$$g_{it} = g + \epsilon_{it}$$

where g_{it} is the growth rate in country i in period t and g is a constant. This equation, which describes fast convergence of the country-specific growth rates to the common rate g, implies that the relative income levels will follow a random walk. To ensure convergence in levels, something more is needed. In order to catch up, laggard nations need to raise their growth rates above those of the currently rich countries.

Case 3: $\lambda_2 = \lambda_3 = 0$, $\lambda_1 > 0$, $\gamma \geq 0$. This is a case of *induced innovation*. Unlike Cases 1 and 2, no diffusion is involved (λ_2 and λ_3 are both zero so the scope for imitation plays no role) and innovation is triggered by relative performance ($\lambda_1 > 0$). Similarities with Cases 1 and 2 also exist. There is conditional convergence in the medium term and unconditional convergence in the very long run. [8]

In Case 3 the expected value of the effects of reform are unrelated to the scope for diffusion as measured by the difference in equilibrium incomes. Convergence is a consequence of a positive λ_1, and this assumption in turn was based on two sets of considerations: poor performance, first, induces large innovations and the expected value of the improvement, second, is positively related to the magnitude of the institutional innovation. The second of these premises may seem shaky, especially if 'diffusion effects' are excluded. It may be of interest therefore to examine the effects of induced institutional change in the case where $\lambda_1 = \lambda_2 = \lambda_3 = 0$.

Case 4: $\lambda_1 = \lambda_2 = \lambda_3 = 0$; ${\sigma_{\mu i}}^2 = g(y_t^{\max} - y_{it})$, $g' > 0$. This case retains the property that countries with big problems choose large reforms, but it is no longer the case that expected benefits of institutional reform will be positive for all but the richest country. With these parameter restrictions the evolution of income will be given by

$$y_{it+1} = [\lambda_0 + \gamma y_{it}^*] + (1 - \gamma) y_{it} + \epsilon_{it} + \mu_{it} \tag{7}$$

where

$$E\epsilon_{it} = E\mu_{it} = 0. \tag{8}$$

Eqs. (7) and (8) may seem to justify the standard growth regression in Eq. (1). One would expect the effects of large reforms to be subject to greater uncertainty than small reforms, however, suggesting that the variance of μ, $\sigma_{\mu i}^2$, will be an increasing function of $y^{\max} - y_i$. It is assumed therefore that the error terms in Eq. (7) exhibit heteroscedasticity.

In principle this problem will not affect the unbiasedness of the estimates but in practice it may have important consequences. Assume, for example, that $\gamma = \sigma_\epsilon = 0$, that $\sigma_{\mu i} = k(y_t^{\max} - y_{it})$ and that the distribution of μ_{it} is given by

$$\mu_{it} = \begin{cases} z_{it} k / (2p)^{0.5} & \text{with probability } p; \quad 0 < p \leq 0.5 \\ 0 & \text{with probability } 1 - 2p \\ -z_{it} k / (2p)^{0.5} & \text{with probability } p \end{cases} \tag{9}$$

where $z_{it} = (y_t^{\max} - y_{it})$. Given these assumptions it is readily seen that if $k/(2p)^{0.5} = 1$ then

$$P(y_{it+T} = y_{t+T}^{\max}) \to 1 \quad \text{for } T \to \infty \tag{10}$$

[8] In order to prove unconditional convergence in the long run, define $z_t = y_{it} - y_{jt}$ for some i, j with $i \neq j$. We then have

(*) $\quad z_{t+1} - (1 - \lambda_1) z_t = v_t \quad \text{if } \gamma = 0;$

(**) $\quad z_{t+1} - (2 - \gamma - \lambda_1) z_t + (1 - \gamma - \lambda_1 + \gamma\lambda_1) z_{t-1} = v_t \quad \text{if } \gamma > 0$

where the stochastic shocks v_t are stationary and have zero mean in both (*) and (**). The deterministic first- and second-order difference equations obtained by setting v_t equal to zero both have a globally stable solution at $z = 0$.

Eq. (10) implies that with a given sample size n, the probability that the regression will show complete convergence can be made arbitrarily small by increasing the length of the period. Of course, the assumption that $k/(2p)^{0.5} = 1$ is extreme, but qualitatively similar effects emerge when $k/(2p)^{0.5} < 1$. From Eq. (7) it follows that (still assuming $\gamma = \sigma_\epsilon = 0$)

$$z_{it+1} = y_{t+1}^{\max} - y_{it+1} = (y_t^{\max} - y_{it}) - \mu_{it} = z_{it} - \mu_{it} \tag{11}$$

Using Eq. (9), Eq. (11) implies that

$$z_{it+T} = (1+s)^{m-j}(1-s)^j z_{it} \tag{12}$$

where $s = k/(2p)^{0.5}$, $m \leq T$ denotes the number of periods in which the shock μ is non-zero, and j is the number of periods in which $\mu = sz$. Both m and j are stochastic variables; m follows a binomial distribution with parameters $(2p,T)$, and the conditional distribution of j given m is binomial with parameters $(0.5, m)$. [9]

Given some arbitrary $\delta > 0$, the conditional probability of $z_{it+T} \leq \delta z_{it}$ given $m = \underline{m}$ can be calculated as:

$$P(z_{it+T} \leq \delta z_{it} | m = \underline{m}) = P((m-j)\log(1+s) + j\log(1-s) \leq \log\delta) \tag{13}$$

$$= P((1\text{–}2j/\underline{m})\, A \leq 2/\underline{m}\log\delta - B)$$

where $A = (\log(1+s) - \log(1-s))$ and $B = (\log(1+s) + \log(1-s))$. With probability 1, $1-2j/\underline{m}$ converges to zero as $\underline{m}$ goes to infinity and, since $A > 0$ and $B < 0$ for all $s > 0$, it follows that

$$P(z_{it+T} \leq \delta z_{it} | m = \underline{m}) \to 1 \quad \text{for } \underline{m} \to \infty \tag{14}$$

With probability 1, $\underline{m}/T$ converges to $2p > 0$ as T goes to infinity and Eq. (14) therefore implies that the unconditional probability of $z_{it+T} \leq \delta z_{it}$ will also converge to one for T going to infinity: [10]

$$P(z_{it+T} \leq \delta z_{it}) \to 1 \quad \text{for } T \to \infty \tag{15}$$

Eq. (15) implies that — given a finite sample of countries — convergence among the countries of the sample will take place with probability 1. To be more precise, for any given values of $\delta > 0$ and $\epsilon > 0$ there exists a $\underline{T}(\delta,\epsilon)$ such that if $T > \underline{T}$ then the probability that all

[9] It is assumed here that $z_{it} > 0$. If $z_{it} = 0$ (and $\sigma_\epsilon = 0$) then $\mu_{it+h} = 0$ and $z_{it+h} = z_{it} = 0$ for all $h > 0$.

[10] For any given $\epsilon > 0$, Eq. (14) implies that it is possible to choose an M which satisfies

$$P(z_{it+T} \leq \delta z_{it} | m \geq M) \geq (1-\epsilon)^{1/2}$$

Now choose a T_0 such that

$$P(m \geq M) \geq (1-\epsilon)^{1/2} \quad \text{for} \quad T \geq T_0.$$

It then follows that

$$P(z_{it+T} \leq \delta z_{it}) \geq P(z_{it+T} \leq \delta z_{it} | m \geq M) P(m \geq M) \geq (1-\epsilon)^{1/2}(1-\epsilon)^{1/2} = (1-\epsilon).$$

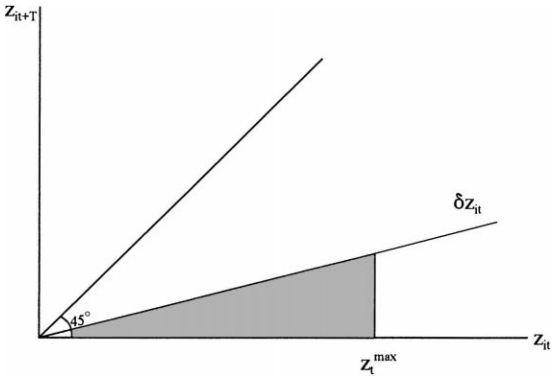

Fig. 1. Convergence: with probability $(1-\epsilon)$ all observations are in the shaded area.

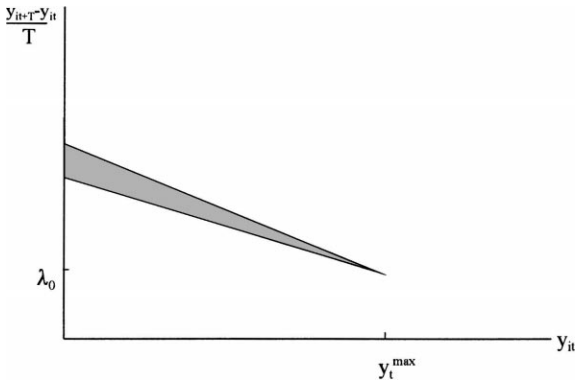

Fig. 2. Growth rates as a function of initial incomes.

observations belong to the shaded area in Fig. 1 will exceed 1–ϵ.[11] The result can also be stated in a slightly different way (see Fig. 2): the probability of finding a strictly inverse relation between the initial level of income and the growth rate can be made arbitrarily close to one by extending the time period T.[12] (Figs. 1 and 2)

It should be noted, perhaps, that these results do not imply that the expected growth rate of poor countries is higher than that of rich countries. By construction all countries have

[11] Simply choose T such that for each country $P(z_{it+T} \leq \delta z_{it}) \geq (1-\epsilon)^{1/n}$ when T > T. By assumption the shocks are independent across countries, and there is therefore a probability greater than or equal to (1–ϵ) that for T > T *all* countries will have reached z-values that are less than δ times their initial levels.

[12] If $0 \leq y_{t+T}^{max} - y_{it+T} \leq \delta(y_t^{max} - y_{it})$ then simple manipulation implies that

$$\begin{aligned}
&\lambda_0 + (1-\delta)/T(y_t^{max} - y_{it}) \\
&\quad = (y_{t+T}^{max} - y_t^{max})/T + (1-\delta)/T(y_t^{max} - y_{it}) \leq (y_{it+T} - y_{it})/T \leq (y_{t+T}^{max} - y_t^{max})/T + 1/T(y_t^{max} - y_{it}) \\
&\quad = \lambda_0 + 1/T(y_t^{max} - y_{it}).
\end{aligned}$$

the same expected growth rate, independently of initial position. A poor country will have a high probability of catching up when T is large — this is what is captured by Eq. (15)— but it also faces a small probability of a disastrous outcome, leaving the expected growth rate at the same level as that of the leading nation.

Case 4 demonstrates that a process of induced institutional change can generate long-run convergence (with probability 1) even if $\gamma = 0$ and the expected value of the effect of each reform on performance is zero. There is an intuitive explanation of this result. Drastic reform measures are likely to gain credibility in countries that have fallen far behind, and the model therefore assumed that the poorer the relative performance, the deeper the perceived structural–institutional failings and the larger the induced reform shock. This structure of the argument makes it akin to the St. Petersburg paradox. Like gamblers who steadily raise their bets each time they lose, slow-growing nations may eventually succeed even though the expected value of each reform is zero. For gamblers the strategy only works if their initial resources are infinite, and along the way some of them will incur large (unbounded) losses. Given the logarithmic formulation of the relative income game in this paper, there is no initial wealth constraint, but some countries will be unlucky for a long time and see their relative income plummet as a result.

This aspect of the argument does not come out in Eqs. (10) and (15) which describe asymptotic results for t going to infinity. For finite periods, however, Eqs. (7)–(9) may produce 'convergence clubs.' A typical pattern for a finite period will show a 'convergence club' of countries that all approach (or, in the case of Eq. (10), reach) the top level of per capita income and a set of countries that fall further and further behind. The size of this latter set shrinks gradually as T increases since with probability 1 all countries eventually join the convergence club.

Even with a small value of T (relative to the sample size n) econometricians may well conclude that $\gamma > 0$. Faced with a dataset that includes a couple of outliers, all of which have been characterized by a sequence of catastrophic institutional changes, the standard impulse would be to delete those outliers from the sample. In the simple case with $s = 1$ (corresponding to Eq. (10)) the resulting subsample gives a γ-estimate of one, an R^2 of unity and no indications of heteroscedasticity or any other statistical problem. Fig. 3 illustrates the simple case with a single outlier (Fig. 3).

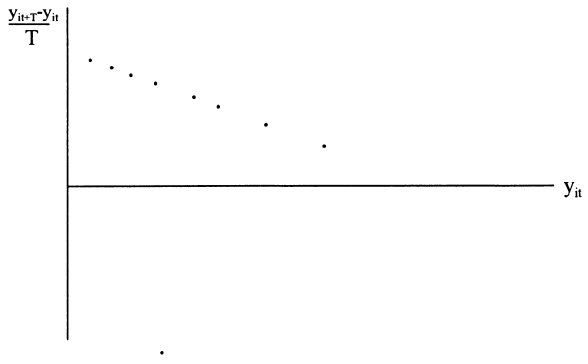

Fig. 3. Convergence clubs: the case with s = 1 and a single outlier.

The real outliers may not even make it into the initial sample if their poor performance has affected the quality and availability of the relevant data. There are some indications that this kind of selection bias may be present in the conditional-convergence regressions, which typically cover a sample of only 50–100 countries.[13] Barro (1991), for instance, has to drop 20 out of 118 countries, but this set of 20 includes the two countries with the worst per capita growth performance over the period (Chad and Mozambique) and four out of the eight worst growth performers. To some extent the problem of data availability for slow-growing countries reflects the fact that many countries with low initial incomes suffered low growth rates (as indeed one would expect from the present perspective), but looking at samples of countries with the same (low) initial income, the bias remains: of 52 countries with initial incomes less than 12.5 percent of the US, 40 were included and 12 excluded from the Barro sample. The average growth rate of the 12 was more than one percentage point below that of the 40 included countries.[14]

3. New growth theory and the interpretation of conditional convergence

New growth theory has followed the convention that behavioural equations be derived from the intertemporal maximization of given utility functions subject to well-defined production possibility sets. This approach has the virtues of rigour and precision but it easily leads to a neglect of institutional and political factors. Not surprisingly, therefore, the 'purity' of the theoretical models has not been retained in the burgeoning empirical literature on economic growth patterns and economic convergence.

The regressions in Baumol (1986), De Long (1988) and other early contributions showed no general tendency to convergence, but by including a set of additional explanatory variables in the growth regressions, a number of writers have found evidence of 'conditional convergence'. These results have been interpreted by Barro (1991) and Mankiw et al. (1992), among others, as a vindication of a modified Solow-type model with constant returns-to-scale or by Bernard and Jones (1996) as evidence of technical diffusion.

An important weakness of this literature is the fragility of the results. There are many degrees of freedom in the specification of the conditioning variables, and given a limited dataset and sufficient ingenuity, many different priors may appear to find empirical support. As shown by Levine and Renelt (1992, p. 942), however, this empirical support is often fragile in the sense that 'only a few findings can withstand slight alterations in the list of explanatory variables,' and in some cases the direction of causation is unclear.[15]

[13] Economic performance can even play a role in the disappearance of existing nations and the emergence of new ones. Developments in Eastern Europe and the former Soviet Union present recent examples of both phenomena.

[14] The variation in growth performance among the low income countries is large (as predicted by the model) but the difference in the average growth rate of the two groups is significant at the 10% level.

[15] Regional evidence from the US or European countries may seem to avoid these problems since studies by, among others, Barro and Sala-i-Martin (1992) have indicated the presence of *un*conditional convergence in these datasets. These results, however, raise other questions. Domestic labour mobility is high in most countries and, according to Blanchard and Katz (1992), may have played an important role in the convergence process. Furthermore, within nation states automatic regional stabilizers operate through both the expenditure and income side of central government budgets. Discretionary regional polices, finally, have acted as additional stabilizers in many countries. Thus, the convergence properties of regional per capita incomes may have little relevance for the convergence of per capita incomes across nations: the regional data suffer from selection bias.

The analysis in Section 2 points to another set of problems. Observed growth patterns include the effects of political and institutional changes which are difficult to quantify. These changes are often the result of deliberate (but not necessarily successful) attempts by policy makers and large interest groups to overcome perceived problems and weaknesses of their economies, but even when no conscious design is involved, the pressures for institutional change almost invariably have important roots in economic problems. The adoption of Keynesian policies in most Western countries during the postwar 'golden age of capitalism' was a response to the depression in the inter-war period; the breakdown of the Bretton Woods agreement came in the wake of the relative decline of the U.S. economy; the Federal Reserve System in the US was created in response to the financial panic in 1907; Latin American ISI policies aimed at increasing the pace of growth and industrialization.

The list is endless, but the general point is simply that induced institutional change in a low-income nation may contribute to β-convergence, and the causes of convergence are not a matter of indifference. It is important whether convergence is the result of a constant adaptation of policies and institutions to ever-changing conditions and demands or whether, alternatively, optimal policy is basically a problem of avoiding distortions and policy-induced instability. Will there be convergence in a laissez-faire system of free markets or, on the contrary, will free markets produce divergence in the absence of stabilizing institutional intervention. [16] The interpretation of the β-estimates will affect the answers to these questions.

The argument in this paper is based on the premise that poor performers tend to undergo institutional upheaval. This premise seems plausible, and the prediction of heteroscedasticity is consistent with the data. [17] . Clearly, however, the analysis in Section 2 is quite mechanical and does not constitute a real theory of institutional change. Institutional change was specified merely in terms of its stochastic effects on income and, ideally, one would want a much more precise specification of the different kinds of institutional reform and their dynamic interaction with economic performance. This goal may be difficult to achieve. The effects of institutional change on performance will be subject to long and variable lags, and short-term fluctuations will often be perceived as simply that: short term and not requiring institutional change. A second set of problems concerns the choice and empirical definition of the institutional and political variables. The relevant space of possible institutional change is hard to define, and the significance of observed changes in seemingly well-defined variables can depend critically on the detailed circumstances of the change. A coup or a change of government, for instance, will in some cases be indicative of a change in policy regime, but the correlation may be weak: economic policies differed little under different West European governments during the years of Keynesian consensus while Mexico under

[16] Similar questions affect other areas of policy. Is the financial system, for instance, fundamentally stable or has institutional intervention, as suggested by Minsky (1986), been critical in stabilizing an otherwise unstable system?

[17] A standard White test rejects homoscedasticity at the 5 percent level in a regression of per capita growth rates on the logarithm and the square of the logarithm of per capita income.

Heteroscedasticity does not disappear after the inclusion of conditioning variables. Thus, Barro (1991) uses White's heteroscedasticity-consistent covariance matrix and his Fig. 2 (p.415), which shows partial association between per capita income in 1960 and the growth rate between 1960 and 1985, indicates an inverse relation between income levels and variance of the residuals.

the leadership of the same party since 1929 has gone through distinct trade and policy regimes.

Conceptual and empirical problems of this kind make both structural modelling and formal econometric treatment difficult.[18] The key point, however, should be quite robust. Unstable growth paths and divergent per capita incomes are likely to cause political intervention and institutional change, and the empirical evidence on convergence reflects both the speed of convergence of an economy to its conditional equilibrium and the changes in the conditional equilibrium itself. These latter changes and their possible endogeneity are largely ignored by the existing literature.

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[18] Econometric studies of the short-term interaction between political instability and economic performance do exist; see for example, Londregan and Poole (1992) and Alesina et al. (1996). Conflicting results have been obtained, however, and the interpretation of the results is hampered by conceptual and practical difficulties surrounding the specification of the interactions.