

Health and Emergence from Development Trap

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Draft – 10 April 2007

Abstract

This paper starts with the assumption that poor countries are trapped in a low-level equilibrium, called a development trap, and that they need to jump out this equilibrium to escape poverty. Assuming this, we show that an economy jumping out of development trap should have a peculiar growth dynamics, characterized by several growth peaks. Using this criterion, we have detected, in a sample of 65 developing countries that were initially at very low level of development in 1950, 12 such countries that we call “emerging economies”: 8 in Asia (Indonesia, Malaysia, Myanmar, Pakistan, South Korea, Sri Lanka, Taiwan (China) and Thailand), 2 in sub-Saharan Africa (Botswana and Lesotho), 1 in Northern Africa (Tunisia) and 1 in Latin America (the Dominican Republic). Comparing emerging and non-emerging economies in the 1950s and early 1960s, we show that a good set of predictors of emergence is related to health conditions in the 1950s. This may be explained both by direct consequences of health on productivity and by indirect effects through the demographic transition and the demographic “bulge” that emerging countries have experienced since the early 1960s. Another significant explanatory variable, which is not independent of the previous one, is education. Economic take-offs that have been observed more recently in China and a few other Asian economies may be related to similar improvements in health, demographic structure and education.

Paper prepared for the Shanghai Forum, 25-26 May, 2007.

1- Introduction

This paper starts with the assumption of existence of multiple equilibria in economic growth. Such multiple equilibria may result from a variety of dynamic interaction mechanisms that have been thoroughly explored in the recent literature. Theoretical models, e.g. Azariadis and Drazen (1990) on education, provide many reasons why multiple equilibria may exist. There is also ample empirical evidence of existence of multiple equilibria, related to convergence club tests: estimation of a non-linear relation between initial income and economic growth (Chatterji, 1992), observation of twin-peaks in the international distribution of incomes (Quah, 1997), tests of difference of growth equation parameters among groups of countries (Durlauf and Johnson, 1995). The latter tests are particularly informative, because they provide a way to detect which variables are involved in the dynamic interaction mechanisms that lead to multiple equilibria. An example is provided by Berthélemy and Varoudakis (1996), who shows that education and financial development play a significant role in the determination of convergence clubs. These contributions on multiple equilibria give support to the recent proposals of “Marshall Plan” to eradicate poverty worldwide, by pulling LDCs out of development trap (e.g., Sachs et alii, 2004, and Commission for Africa, 2005).

The existing literature on the identification of convergence clubs is useful, but more needs to be done to draw policy-relevant conclusions. Previous papers do not provide empirical evidence on jumps from one equilibrium to another. In fact, they do not provide even a way to detect such jumps. In absence of such evidence, advocating a “Marshall Plan” strategy for poor countries lacks solid empirical foundations. This paper is an attempt to start filling this gap. First, we define a method to detect countries that have actually achieved an equilibrium jump. This method rests on the idea that the growth pattern of an economy that has jumped from a low equilibrium to a higher equilibrium, which we call an “emerging economy”, should be characterized by multiple growth peaks. Using this criterion, we detect, amongst economies that were very poor in 1950, about 12 such emerging economies, which have all started their emergence process in the 1960s. Comparing these initially poor emerging economies with poor non-emerging economies provide a way to detect what factors have been responsible for their emergence. In this paper, we propose such a comparison, based on the analysis of structural differences between initially poor emerging and non-emerging economies in the 1950s and early 1960s. In this search of factors that could explain equilibrium jumps, we eliminate a number of natural candidates, notably saving rates, population growth, economic diversification and trade openness. As far as data availability permits, we also eliminate governance. On the other hand, we identify two very promising, and interrelated, candidates: health and education.

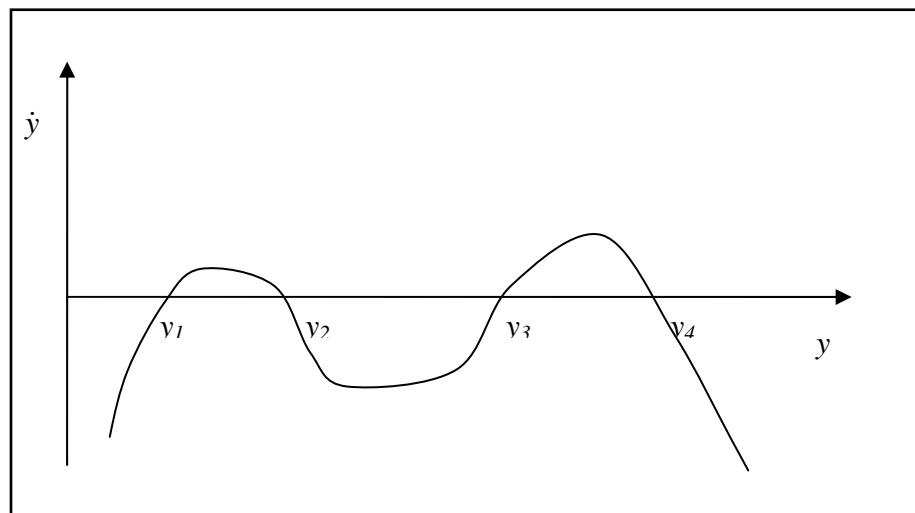
The paper is organised as follows. In section 2, we propose a very general multiple equilibria analytical framework, from which we derive our definition of “emerging economies”. In section 3, we use data from 1950 to the early 2000s provided by Maddison (2003) to detect economies that were initially poor in 1950 and have followed a growth path consistent with our definition of emerging economies. In section 4, we review theoretical mechanisms possibly responsible of the development trap that have been studied in the previous literature. In section 5, we start discussing the relevance of such mechanisms through a study of stylized facts of emerging economies in the 1950s and early 1960s, compared to countries that were equally poor in 1950 but have not emerged. This discussion is followed in section 6 by the estimation of a logit model that explains the emergence of emerging economies. In section 7, we study implications of our results for the analysis of more recent economic take-offs, such as in China. We conclude in section 8.

2- Analytical framework

The possible existence of multiple equilibria has been recognized very early in the theory of economic growth. The standard argument is that cumulative processes lead to an economic decline when the economy is initially below a certain threshold of economic development, while cumulative economic progress is possible when this threshold has been passed.

This multiplicity of equilibria can be represented in the following graph, where the growth rate, g , is represented as a function of the income level, y . Each point of intersection of this $g(y)$ curve with the horizontal axis corresponds to a steady state, as depicted in figure 1. In figure 1, the second and the fourth steady states (y_2 and y_4) are stable while the first and the third ones (y_1 and y_3) are unstable.

Figure 1: Multiple Equilibria in GDP per capita



Source: Author

In absence of a shock that would trigger an equilibrium jump, we would never observe, for a given economy, the full curve depicted in figure 1. The only non-monotonic dynamics that we could observe would be, in positive cases, single positive growth accelerations, from y_1 to y_2 , or from y_3 to y_4 , and in negative cases single negative growth accelerations. We call “growth peaks” such episodes of positive growth acceleration as from y_1 to y_2 , or from y_3 to y_4 .

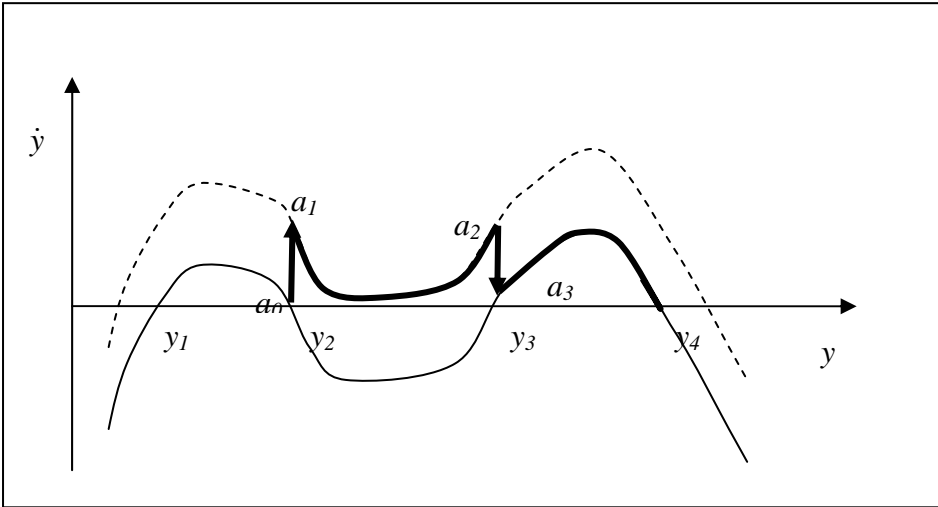
These growth peaks correspond to what Hausmann, Pritchett and Rodrick (2005) call growth accelerations, which they consider decisive turning points in development. However, a single growth peak cannot be really considered as a major turning point: in our multiple equilibria framework, it may merely mean convergence to a stable equilibrium, and not the more radical change that would be associated with a jump from one stable equilibrium to another. To obtain such a radical change, more than one single growth peak is therefore necessary. Hence, we submit the following proposal:

Assuming that there are multiple equilibria, a sufficient condition to detect a jump of an economy from the neighbourhood of a low stable equilibrium to the neighbourhood of a higher stable equilibrium is to observe multiple growth peaks in this economy's growth path. Observing a single growth peak is not a sufficient condition.

Equilibrium jumps can be observed only if there is at a point in time a shock to the $g(y)$ curve, sufficiently large to lead to a radical change of equilibrium. This shock can be a combination of a vertical shift and of a horizontal shift of the $g(y)$ curve.

A vertical shift corresponds to a temporary productivity shock (figure 2). If positive, such a shift may under certain circumstances lead the economy considered from the neighbourhood of the low equilibrium to the neighbourhood of the high equilibrium, as in figure 2. Such a shock may have a temporary character, but if the economy gets close enough to y_4 (i.e. reaches a point located to the right of y_3) before the end of this shock, it will continue converging toward the high level equilibrium y_4 .

Figure 2: Effect of Temporary Productivity Shock on Growth



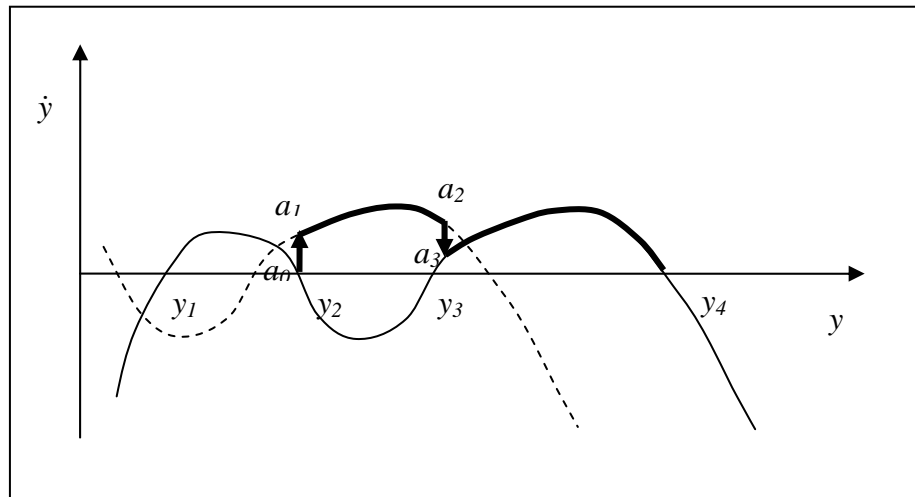
Source: Author

A horizontal shift (figure 3) corresponds to a temporary transfer of income (or a temporary gain in terms of trade). If positive and sufficiently large this shock can push the economy considered close to y_4 . Again, if the economy has reached a level higher than y_3 before the ending of the shock, it may continue converging toward the high level equilibrium y_4 .¹

In both cases, the jump from the neighbourhood of y_2 to the neighbourhood of y_4 leads to a very specific growth dynamics. An economy starting close to y_2 starts with a low growth rate. From this point, only a growth acceleration associated with a positive shock can push this economy to the right of y_3 . This implies a first growth peak. After this move, the economy will experience a second, endogenous, growth peak, corresponding to the y_3 - y_4 portion of the $g(y)$ curve, unless the initial shock is large enough to push initially the economy to the right of the maximum of this curve. Hence, strictly speaking, our sufficient condition to detect equilibrium shifts is not a necessary one, because if an economy enjoys a long enough positive shock, it can reach the neighbourhood of the high stable equilibrium y_4 in one, very large, leap forward.

¹ In figure 3, y measures income net of transfer, so that the $g(y)$ curve shifts to the left when the economy receives a transfer. From a_0 , the economy jumps to the new $g(y)$ curve on a_1 , and when the transfer is eliminated it jumps again to the old $g(y)$ curve, from a_2 to a_3 .

Figure 3: Effect of Temporary Transfer Shock on Growth



Source: Author

3- Identification of emerging economies

Our previous analysis provides the basis of our empirical investigations: we shall detect equilibrium jump cases by observing developing countries that have gone over time through multiple growth peaks paths.

The observed growth dynamics of a large number of developing countries are analyzed here, using the annual time series built by Maddison (2003), some of which have been updated in the database recently released by the Groningen Growth and Development Centre and the Conference Board (henceforth GGDCB). This dataset provides series from 1950 to 2001 (and up to 2006 in the latest GGDCB update); it is thus more complete than the more often used Heston, Summers and Aten (2002) series, which begin only later (sometimes in the 1950s, and in 1960 in many instances) and end at best in 2000. To observe jumps from one equilibrium to another, one needs to compare growth performances of countries that were initially at similar levels of development but that diverged later. Using as long a time series as possible is an advantage.

We consider here only economies that were poor in the 1950s, in order to compare two subsets of economies that were initially comparable, in terms of GDP per capita: those who have emerged and those who have not emerged. Our sample includes 65 developing economies with complete purchasing power parity GDP per capita series available for the whole period 1950–2001 or beyond: 39 in Africa, 17 in Asia, 6 in Middle East and North Africa, and 3 in Latin America. Eastern Europe and Central Asia transition economies are excluded, because the changes there have occurred only recently. Cuba and a few African countries for which the data quality was very poor are also excluded.

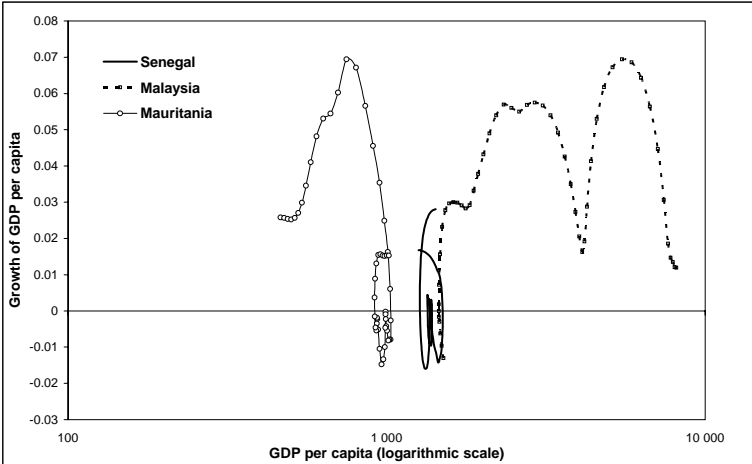
To eliminate the short-run cyclical component of these time series, the data were transformed with an appropriate Hodrick-Prescott filter.² Observing the relation between the transformed GDP per capita series and their growth rates provides the empirical basis for drawing the equivalent of the $g(y)$ curves and possibly for uncovering multiple growth peak patterns

² The series transformed with the Hodrick-Prescott filter is the natural logarithm of GDP per capita.

associated with equilibrium jumps. Given that the $g(y)$ function is presumably only an imperfect aggregation function, a different pattern for each economy is used here, instead of using a panel data approach.

In the case of a single growth peak, which may characterize a standard dynamic path of convergence to a stable steady state equilibrium, the observed $g(y)$ curve has an inverted U shape. This shape is observed in 20 cases out of 65, related in some instances to significant economic progress since 1950. The example of Mauritania is provided in figure 4.

Figure 4: Examples of growth dynamics



Source: Author’s computations based on GGDCCB.

In several other instances, the observed $g(y)$ curve depicts a multiple growth peaks pattern instead of a single growth acceleration. The example of Malaysia is provided in figure 4.

With a few exceptions, situations in which the economy has not achieved progress since 1950 are associated with the absence of any significant growth peak. In most such cases, the economy is cyclically stagnating around its initial level, as in the case of Senegal, reported in figure 4.

Using a parametric method to detect single and multiple growth peaks would be inappropriate, given the peculiar shape of a $g(y)$ curve featuring multiple peaks. A simple nonparametric method is proposed here, based principally on the observation of the curves drawn for the different economies. To be more precise, a growth peak is defined as an episode in which growth is accelerating for at least seven consecutive years, is positive throughout the same period, and peaks at a pace of at least 3.5 percentage points.

Given the elimination of the short-run cyclical component of the times series, they display very few short-term fluctuations, allowing many cases of continuous growth acceleration phases for long periods of time to be identified. There are, however, a few instances in which such fluctuations have not been fully eliminated, leading to relatively frequent ups and downs instead of smooth acceleration and deceleration patterns. Such inconvenience is minor when as a result the count of peaks drops from one to zero, given that the aim here is to detect multiple growth peak patterns. This is a drawback, however, in the cases of Lesotho, and Taiwan (China), where the growth graphs suggest multiple growth peaks that do not pass our test because of their relatively short duration. For these two economies, there are so many

peaks in the period (despite the Hodrick-Prescott smoothing) that each of them could be only of a rather short duration. Ignoring the intermediate small fluctuations between the start and the end of the growth peak, the data suggest that multiple peaks existed in these two economies as well.

In total, we have identified in our sample 12 economies with multiple growth peaks, 20 economies with one single growth peak, and 33 economies without any growth peak.

Our observations can be compared to the findings of Hausmann, Pritchett, and Rodrik (2005), who detect many growth acceleration episodes in the Heston and Summers time series, although their approach is somewhat different. Hausmann, Pritchett, and Rodrik use raw GDP per capita series, not series transformed with the Hodrick-Prescott filter. They use a definition of acceleration based on the average acceleration over a given period of time (of seven years), which means that the smoothing procedure is part and parcel of the method of detection of accelerations. Searching for steady accelerations for a relatively long period of time – as we do – would lead to no result with raw data, because in most instances short-term cyclical fluctuations would prevent the observation of a steady acceleration. We prefer to first smooth out the series, with a procedure that is independent of the search of acceleration episodes, before identifying such episodes. Hausmann, Pritchett, and Rodrik find single growth accelerations in 14 developing economies belonging to our sample, and multiple growth accelerations in 10. They find more multiple growth acceleration cases than us in Africa, but in cases that are rather dubious (Ghana, Guinea Bissau, Nigeria and Uganda), given that we find no acceleration at all in these cases.

As a result of their prolonged growth cycle patterns, economies with multiple growth peaks, i.e. emerging economies in our definition, have usually performed much better than others. In particular, all of them grew faster than the United States, i.e. at a yearly rate higher or equal to 2.1 percent (table 1).

Table 1: Economic performances of emerging economies

Country	average growth 1950- 2000 (%)	GDP/capita 1950s (1990 PPP US\$)	GDP/capita 1990s (1990 PPP US\$)
South Korea	5.8	1000	11100
Taiwan (China)	5.6	1200	13000
Botswana	5.2	400	3600
Thailand	4.0	900	5900
Malaysia	3.3	1500	6800
Lesotho	3.1	400	1400
Myanmar	2.7	500	1000
Tunisia	2.7	1200	3700
Indonesia	2.6	1000	3100
Pakistan	2.2	600	1800
Dominican Republic	2.2	1200	2700
Sri Lanka	2.1	1300	2900

Source: Author's computations based on GGDCCB.

By comparison many economies that have experienced single or no growth peaks have achieved only modest average growth performance since 1950. Eighty five percent of these economies (45 out of 53) grew less rapidly than the United States, implying that their divergence the developed economies deepened over time.

A comparison of GDP per capita of emerging and non-emerging economies shows also clearly that, although the former had incomes comparable to the latter in 1950 and 1960, these two groups of economies diverged rapidly in the 1960s. In 1980, emerging economies had already significantly higher GDP per capita than non-emerging economies (table 2).

Table 2: GDP per capita from 1950 to 1980 compared in emerging and non-emerging initially poor economies

	overall average	average emerging economies	average non emerging economies	difference	standard error of difference
ppp gdp per capita 1950	761.4	837.2	744.2	93.0	100.6
ppp gdp per capita 1960	915.4	1020.2	891.7	128.5	115.3
ppp gdp per capita 1970	1176.0	1470.3	1109.4	361.0	192.3 *
ppp gdp per capita 1980	1438.6	2496.2	1199.1	1297.1	288.0 ***

Source: Author's computations based on GGDCCB.

*** (resp. **, *) = difference significant at the 1% (resp. 5%, 10%) threshold.

4- Structural characteristics of emerging vs. non-emerging economies: theoretical insights

The existing theoretical and empirical literature on economic growth and convergence clubs identifies a variety of factors that may lead to multiple equilibria and/or influence the growth path of an economy in such a way that it can jump from one equilibrium to another.

The oldest of these arguments was labelled by Nurkse (1953) as the poverty trap hypothesis and is related to the analysis of the dynamics of accumulation of factors of production. Nelson (1956) provides a formal framework in which capital accumulation could be characterized by a cumulative process, due to the absence of savings capacity when incomes are very low. As a consequence of this assumption, at low levels of capital stock, savings and investment are not large enough to cover capital depletion and demographic growth, so that the growth rate of the capital/labour ratio of the economy declines when its initial level is below a certain threshold and increases immediately above this threshold. A crossing of this threshold by emerging economies would imply that they have, during their initial stage of emergence, a higher saving rate than non-emerging economies.

This idea is germane to the notion that there is an incompressible minimum level of consumption. In economies approaching this extreme absolute poverty level, the demographic growth rate may also be affected. This hypothesis, initially introduced by Leibenstein (1954), is also discussed by Solow (1956), to suggest the possible existence of several steady state equilibria in his growth model. Typically, there is a low income – high population growth stable equilibrium and a high income – low population growth stable equilibrium. Beyond the dynamics of total population, changes in death rates and birth rates that are triggered by a transition from the low income – high population growth equilibrium to the high income –

low population growth equilibrium lead to a significant change in the age structure of population. Typically, there is a long demographic transition period in which the dependency rate decreases, which is favourable to per capita GDP growth and facilitates the transition path from the former equilibrium to the latter. Such a change of equilibrium should therefore be associated initially with the early stages of demographic transition.

However, given that changes in death rates and birth rates are highly correlated with health improvements, we should consider also the possibility that there exists a more direct channel from health progress to economic emergence. Better health may imply higher labour productivity, which improves incomes, and higher incomes may lead in turn to better health, notably through nutrition. This health – income – nutrition nexus is well documented in the microeconomic literature (e.g., Strauss and Thomas, 1998). At the macro level, there is also evidence of a twin-peak distribution of life expectancy, which suggests the existence of multiple equilibria associated with health developments (Mayer-Foulkes, 2003). If this mechanism is at work in the initial stage of development of emerging economies, one should observe that emerging economies have initially better health conditions than non-emerging economies.³

The possibility of multiple equilibria has been also considered in the course of discussions on the role of education in the development process. The theoretical model proposed by Azariadis and Drazen (1990) clearly shows that a low level of educational development could lock an economy into a situation of underdevelopment. The paucity of initially available skilled labour resources considerably reduces the effectiveness of the education system and the return on education, obstructing the process of human capital accumulation, since the private return on human capital falls so low that parents do not invest in the education of their children. In this analysis, the education sector has a property similar to that attributed to the research and development (R&D) sector in standard endogenous growth models, i.e. it generates dynamic externalities. When the stock of knowledge available within the population is insufficient, the gains from this externality cannot materialize. As a result, growth is held back, unless the state implements a strongly proactive education policy. Following this argument, one could well observe dynamically stable situations in which education is poorly developed and where investing in education is not profitable for individuals. Then, one should observe that a jump from low equilibrium to high equilibrium be associated with initially improved education performances.

In developed economies, economic growth is associated to a large extent with productivity gains, related in particular to the results of R&D activity, and not only with factor accumulation. This may create non-standard growth patterns given the dynamic externalities characterizing the R&D sector. In a developing economy, some of these productivity gains may be imported from more advanced economies. But structural changes in the domestic economy may lead to productivity gains as well, with nontrivial consequences for the dynamics of the economy. Berthélemy and Varoudakis (1996) explore this possibility regarding the financial deepening process. In a poor economy, the initially weak state of the financial system and the low income level of the population may persist and reinforce each

³ Theoretically, such cumulative processes could be modelled in a general framework in which the possibility of multiple equilibria would be related to a non-convexity of the production function. More precisely, in such an analytical framework, one would observe increasing returns at low levels of incomes. This assumption, which is similar to the increasing returns to scale assumption made by Rosenstein-Rodan (1943), was also recognized by Solow (1956) as possibly creating multiple equilibria in his growth model. However, this broad non-convexity argument is too general to be testable.

other as a result of a cumulative process: low incomes imply that the amount of savings to be intermediated is small, which leads to high unit costs and weak competition in the financial sector. The result is a sluggish and inefficient capital accumulation process – owing to both the insufficient size of the financial sector and its imperfect competition – that prevents economic growth and locks the economy into a low-level equilibrium. Hence, a jump from a low equilibrium to a higher equilibrium might also be related to initial changes in the performances of the financial sector.

Another structural change in the economy that may lead to multiple equilibria is related to the diversification process. Several researchers have suggested that the level of diversification of an economy could have a positive effect on the growth process. In a contribution to the analysis of the role of diversification in economic growth in South Korea and Taiwan (China), Feenstra and others (1999) conclude that output diversification could play a role in the growth process that is very similar to the role of input diversification considered in the seminal endogenous growth model of Romer (1990). Diversification may also reduce the vulnerability of an economy to external shocks, creating conditions favourable to economic growth, if only because the economy can then invest in higher risk, higher payoff projects. In parallel, there are some reasons to believe that economic diversification is influenced by the level of development attained by the economy. Imbs and Wacziarg (2003) show empirically that the diversification of an economy could be related to its development level, measured by GDP per capita, through an inverted U-shaped relation. This relation may lead to multiple equilibria when combined with the usual arguments that a more diversified economy has greater growth potential.

The institutional framework may also be characterized by dynamic cumulative processes, which may draw an economy toward a poverty trap under some circumstances. Collier (2006) discusses this possibility in some detail. According to his analysis, two factors related to institutional failures – corruption and civil strife – are relevant to explaining observed political and economic cumulative crisis situations in developing economies, particularly in Sub-Saharan Africa.

Tirole (1996) discusses vicious circles of corruption in a game theory framework. Where corruption is high, individuals have no incentive to invest in reputation and therefore remain corrupt. In contrast, in a low corruption equilibrium, a bad reputation has a high cost, and being corrupt is not profitable. Krueger (1993) discusses a related phenomenon of pervasive rent-seeking, in the framework of political economy models. Political economy models can also be used, as suggested by Collier (2006), to explain situations in which civil strife and poverty reinforce each other, leading to the possible existence of multiple equilibria.

In summary, a large number of state variables that are highly influential in the growth dynamics may lead to cumulative processes and to multiple equilibria. In the next sections, we shall provide an empirical analysis of these factors, to identify those that played actually a role in the economic take-off of emerging economies.

5- Structural characteristics of emerging vs. non-emerging economies: stylised facts

We start our empirical analysis with stylised facts, which we shall complement in the next section with an econometric exercise. We discuss the following factors: health and demography, education, economic structure, polity and institutions, geography.

Health and demography

Bloom, Canning and Malaney (2000) show that health and demography had a major influence on economic growth in East Asian economies. Their findings justify studying with some details such factors as possible explanatory variables of emergence.

Table 3: Health and demographic factors compared in emerging and non-emerging initially poor economies

	overall average	average emerging economies	average non emerging economies	difference	standard error of difference
pop. growth 50-60	2.2	2.2	2.5	0.3	0.2
infant mortality 1950	177.7	138.3	186.6	-48.3	10.0 ***
life expectancy 1950	39.5	46.3	37.9	8.4	1.5 ***
dependency rate 1950	81.3	82.6	81.0	1.6	2.6
dependency rate 1960	86.8	88.9	86.3	2.6	2.4
growth of depend. rate 60-70	5.3	1.4	6.2	-4.9	1.6 ***
population density 1950	37.2	71.9	29.4	42.6	17.7 **

Source: Author's computation base on UN Population division database and, for Taiwan (China), Directorate-General of Budget, Accounting and Statistics (DGBAS).

*** (resp. **, *) = difference significant at the 1% (resp. 5%, 10%) threshold.

In 1950, poor emerging and non-emerging economies had similar population growth rates, and similar dependency rates (defined as the proportion of non-working age population to working age population). However, as shown in Table 3, they had, already in 1950, better health conditions. Life expectancy was significantly higher in emerging economies, with an average difference of 8.4 years. They had also significantly lower infant mortality rates. This may partly result from historical and geographical factors. Acemoglu and Johnson (2006) identify four main reasons why health conditions started improving in the 1950s in parts of the developing world: the development of penicillin, other antibiotics and new vaccines (such as against yellow fever); the discovery of DDT and its widespread use against mosquito vectors; the establishment of WHO, which facilitated the spread of health progress to poor economies; and a change in international values in favour of the spread of medicine discoveries to all countries. However, such factors have not spread health breakthroughs equally over all regions of the world, the African continent lagging behind others. There is for instance evidence that the WHO global initiative to fight malaria launched in the 1950s has been much more effective in Asia than in Africa.

Acemoglu and Johnson (2006), using an extended Solow framework and a large cross-section time series data set, find that health progresses have not improved economic performance in the 1960s to 1990s decades. Their results contrast however with previous findings by Bloom, Canning and Malaney (2000) on Asia. They contrast also with findings by Bhargava and others (2001), who successfully test a relation between adult survival rates and economic growth in low income countries. It might be that the health – growth relation be country-specific and hence difficult to estimate using a broad cross-section. This is at least what would be expected in a multiple equilibria setup, where countries belonging to different convergence clubs may have different growth patterns.

Beyond the direct channel related to the health – income – nutrition nexus, the indirect channel from health improvement to economic emergence through demographic transition is

also observable in our data. Reduced infant mortality has triggered a significant decline in fertility rates, and hence the beginning of demographic transition. Although the groups of poor emerging and non-emerging economies had very similar dependency rates in the 1950s, they diverged in this respect from the 1960s onward. The former have enjoyed strongly stabilizing (and thereafter declining) dependency rates, while the latter were handicapped by increasing dependency rates, associated with the combination of declining mortality rates and stable fertility rates.

The demographic transition observed since the 1960s could be considered as endogenous to their good economic performance in the same period, and tests of the relation between demographic transition and economic emergence could then be contaminated by a simultaneity bias. Following Bloom, Canning and Malaney (2000), we have estimated an equation that suggests that reasonably good instruments of the growth rate of dependency rate in the period 1960 – 1970 are the infant mortality and fertility rates of 1960 and the growth rate of dependency rate from 1950 to 1960, which are all related to initial health and demographic conditions, and independent from economic performances in the 1960s.⁴ We shall use this equation in the next section to instrument the growth rate of dependency rate, in order to correct for possible endogeneity of this variable.

Another demographic variable for which there is significant difference between poor emerging and non-emerging economies is the population density. However, the difference between the two groups of economies is less significant than for previous variables, and we shall show in the next section that this variable cannot be considered as a robust predictor of emergence.

Education

When we look at education budgets, it seems that there is no difference until the 1960s in education policies of emerging and non-emerging initially poor economies. However, education achievements are vastly different. Data on human capital for 1960 produced by Barro and Lee (2001)⁵ show that there were 3.9 (resp. 1.9) times more adults with complete (resp. complete or incomplete) primary education in emerging economies than in non-emerging economies. Using detailed data on school enrolment published by UNESCO (1955) and demographic data from the UN population division database, we have also estimated school enrolment rates for the early 1950s for 63 economies. These estimates show that, both in primary and in secondary education, enrolment rates were in the early 1950s twice as high in emerging economies as in non-emerging economies.

Several reasons may explain the discordance between education achievements and public education expenditure. First, several emerging economies initiated very early ambitious education policies, possibly implying better efficiency of resources spent in this sector. A good example is South Korea (Lee, 1995). Second, compared to African economies, Asian emerging economies have from the beginning spent relatively more resources on primary education than on higher levels of education (Berthélemy, 2006). Third, there was in the 1950s more private education in emerging economies than in non-emerging economies,

⁴ This specification is equivalent to that used by Bloom, Canning and Malaney (2000). The results are:

$$depg_{60-70} = -0.105 + 0.204 depg_{50-60} + 0.035 infm_{60} + 1.365 fert_{60}$$

$$(0.060) \quad (0.072) \quad (0.017) \quad (0.961)$$

$$R^2=0.23 \quad n. obs.=65$$

where *depg* is the growth of dependency rate, *infm* the mortality rate and *fert* the fertility rate.

⁵ We have data for 39 out of our 65 countries with data available in the Barro and Lee dataset.

notably in secondary schools, e.g. in Indonesia, South Korea and Thailand, where the share of private schools in secondary enrolment was higher than one third. Fourth, such data on private education suggest a strong demand for education in emerging economies, which may be due to higher education returns; this may be related to another indirect effect of better health conditions, given that mechanically higher life expectancy implies higher returns to education. As shown in Table 5, enrolment rates in 1960 are highly correlated with life expectancy after controlling for enrolment rates in the early 1950s. Similar results are obtained when using lagged observations for life expectancy.⁶

Table 4: Education
compared in emerging and non-emerging initially poor economies

	overall average	average emerging economies	average non emerging economies	difference	standard error of difference
education exp./GDP 1965	3.1	3.4	2.9	0.5	0.5
human capital 1960	1.7	2.6	1.3	1.3	0.4 ***
% adults w. compl. primary educ.	13.8	24.0	9.3	14.6	3.7 ***
% adults w. primary educ.	31.4	46.4	24.8	21.6	6.9 ***
primary school rate early 1950s	29.2	62.6	21.4	41.3	6.5 ***
secondary school rate early 1950s	3.5	7.7	2.5	5.2	1.8 ***

Source: Author's computation based on Barro and Lee (2001), UNESCO (1955), UN Population Division, World Bank's World Development Indicators, and DGBAS.

*** (resp. **, *) = difference significant at the 1% (resp. 5%, 10%) threshold.

Table 5: influence of life expectancy on school enrolment rates

	primary enrolment rate 1960	secondary enrolment rate 1960
enrolment rate 1950	0.466 *** (0.127)	0.659 *** (0.095)
life expectancy 1960	1.815 *** (0.527)	0.449 *** (0.096)
Intercept	-45.638 ** (20.970)	-16.092 *** (4.130)
R ²	0.62	0.70
Nobs	53	54

Source: Author's computations.

*** (resp. **, *) = significant at the 1% (resp. 5%, 10%) threshold; standard deviations between brackets.

Economic structure

With respect the economic structure, there are few comparable data for the 1950s and early 1960s. In order to compare savings and investment performances, we use saving rates (Table 6) in 1965,⁷ which is the first year for which we have enough observations (46 economies). We find no difference between emerging and non-emerging economies. This is a strong result, given that, savings being endogenous to economic performances, one would expect relatively high saving rates in emerging economies in 1965, i.e. after the beginning of their

⁶ Acemoglu and Johnson (2006) looked at this point as well but did not find similar evidence. This may be due to the fact that they used education data starting in the 1960s, i.e. after the take-off of schooling performances in emerging economies.

⁷ Investment rates comparison lead to similar results.

take-off process in most cases. Such high savings rates in emerging economies have been observed later, but not during the first years of emergence. This suggests strongly that high savings is a consequence of emergence, not a primary cause.

Table 6: Economic structure
compared in emerging and non-emerging initially poor economies

	overall average	average emerging economies	average non emerging economies	difference	standard error of difference
saving rate 1965	11.8	11.2	11.9	-0.7	3.7
financial depth (M3/GD)1965	17.4	25.9	14.9	11.0	3.3 ***
openness 60-69 (% of years)	7.9	22.5	4.6	17.9	7.5 **
share of manuf. export 1965	11.5	17.5	9.9	7.6	7.2
landlockedness (%)	27.7	16.7	30.2	-13.5	14.4

Source: Author's computations based on World Bank's World Development Indicators and DGBAS.

*** (resp. **, *) = significant at the 1% (resp. 5%, 10%) threshold.

We find however that emerging economies had, already in the early 1960s, a significantly higher financial depth than non-emerging economies. Given the previous results on savings rates, this result can be considered robust to a possible endogeneity bias: given that if financial depth were endogenous to economic performance, the channel of transmission would be primarily through high savings. Moreover, this observation is consistent with previous findings by Berthélemy and Varoudakis (1996), who find that financial depth is a significant determinant of convergence clubs. Higher financial depth may imply both better savings mobilization and better allocation of capital.

We have also tried to find a relation between emergence and economic openness. Using the Sachs and Warner indicator, we find that emerging economies were significantly more open than non-emerging economies at the 5% level. However, we should note that economic openness may be endogenous to economic performance. In fact, in our econometric exercise in next section, we find that openness does not play a significant role after controlling for other variables. In an attempt to solve this endogeneity problem, we have also tested whether there were less landlocked countries in the group of emerging economies, with a negative result, suggesting again that trade openness has not been a major initial factor in the economic take-off process of emerging economies.

With respect to diversification through manufacture exports, we find no relation whatsoever with emergence in the 1960s. Diversification has been observed later in the process of emergence of emerging economies, but was still very low when this process started.

Polity, institutions and geography

To complement the previous picture, it is useful to consider other possible explanatory variables that could influence the emergence process. Good governance is nowadays considered as a pre-condition of economic development. Myrdal (1968) suggests in the 1960s that South-East Asia, where there are today many emerging economies, could not take-off notably because corruption and government misconducts were pervasive there. Myrdal's analysis suggests therefore that governance was not particularly good in emerging economies when they emerged. There are however few comparable data available for this period on

institutional factors. We have nevertheless attempted to test the role of political governance by using the democracy indicator (in 1960 or immediately after) available in the Polity IV database. There is no significant difference of degree of democracy among emerging and non-emerging economies. Of course, the sample is relatively limited, because many countries were not independent at that time. There were more politically independent countries in the group of emerging economies than in the group of non-emerging economies in the 1950s, but we find in the next section that this variable is not a robust determinant of emergence after controlling for other variables.

Finally, we have considered historical and geographical variables that are usually considered as good predictors of governance: ethnic fractionalization in 1960 (Easterly and Levine, 1997), the mortality of settlers (Acemoglu, Johnson and Robinson, 2001), and distance to equator. Ethnic fractionalization appears significantly lower in emerging than in non-emerging economies, but only at the 10% significance threshold. Distance to equator is also significant, at the 5% level. Of course, such variables can be considered only as supplementary control variables, given that they are constant over time. In the next section, we will show that such variables do not add much to our explanation of the emergence process. We have also tested a conflict variable defined as the total number of years of war in either the 1950s or the 1960s decade, for which we find no statistically significant difference between our two groups of countries.

Table 7: polity, institutions and geography compared in emerging and non-emerging initially poor economies

	overall average	average emerging economies	average non emerging economies	difference	standard error of difference	
democracy (polity IV) 1960	1.7	1.8	1.7	0.1	1.0	
political independence 1950(%)	30.8	66.7	22.6	44.0	13.9	***
number of years of war 1950s	1.0	2.0	0.7	1.3	2.2	
number of years of war 1960s	1.0	0.9	1.0	0.1	0.8	
ethnic fractionalization	56.4	42.3	60.5	-18.2	9.3	*
mortality of settlers	398.2	81.2	461.6	-380.4	262.5	
distance to equator	14.9	20.7	13.6	7.1	3.0	**

Source: Author's computation base on Polity IV database (University of Maryland), UCDP/PRIO Armed Conflict Dataset, Easterly and Levine (1997), and Acemoglu, Johnson and Robinson (2001).

*** (resp. **, *) = significant at the 1% (resp. 5%, 10%) threshold.

6- Logit estimation of the probability of emergence

In this section we propose logit estimations of the probability of emergence. The total sample is made of 65 economies that had all an income per capita (in PPP 1990 US\$) not higher than US\$ 1500 in the 1950s. Among these economies, 12 have emerged, and we test whether their probability of emergence has been influenced by the variables previously discussed. Such tests are performed using a logit estimation.⁸ In this exercise, we correct the variance – covariance matrix to take account of a possible regional spillover effect that would imply a clustering of economies belonging to the same region.⁹

⁸ Probit equations lead to very similar results.

⁹ Our regions are: Africa, Asia, Latin America and MENA.

Given the limited size of the sample, we need to use as parsimonious a method as possible. We start with demographic and health data: life expectancy in 1960 and the rate of growth of the dependency rate between 1960 and 1970, the latter being instrumented with its rate of growth in previous period (1950-60), infant mortality in 1960 and fertility in 1960. We also consider human capital measured by the proportion of adults (above 15) who have completed primary school.

All three variables have the right sign and are highly significant, as shown in Table 8 (equations [1] to [3]). Increased life expectancy and education outcome, and decreased dependency rates, are reasonably good partial predictors of emergence of poor economies in the early 1960s. However, in equation [3], the sample is limited by the availability of data in the Barro and Lee database. In order to extend the sample, we observe that the proportion of adults with complete primary education in 1960 is highly correlated with the primary and secondary school enrolment rates that we have estimated for the early 1950s. The R^2 of this relation is about 0.70, suggesting that primary and secondary enrolment rates in the early 1950s are good predictors of the proportion of adults with complete primary education in 1960. We use this equation to compute “predicted” values of the proportion of adults with complete primary education in 1960, which we use in equations [3bis] and [4]. By doing so, we extend our sample from 39 to 63 observations.

In equation [4], we combine all three variables, and all of them remain significant. In summary, equation [4] suggests that health plays a major role in emergence, through three channels: 1- a direct channel, which is related to the direct consequences of better health on human productivity; 2-demographic transition; and 3- improved education outcomes.

Table 8: logit estimation of probability of emergence:
health, demographic and education variables

	[1]	[2]	[3]	[3bis]	[4]	[5]
life expectancy 1960	0.319 *** (0.045)				0.311 *** (0.093)	0.210 (0.180)
growth dependency rate 1960-70		-51.614 *** (15.400)			-41.163 *** (14.610)	-0.344 (0.221)
% adults with compl. prim. scol 1960			0.120 ** (0.050)	0.145 *** (0.053)	0.035 ** (0.176)	0.048 (0.022)
financial depth 1965						0.099 (0.041)
Intercept	-16.459 *** (2.556)	0.873 (1.001)	-2.530 ** (1.191)	-3.326 *** (1.164)	-14.458 *** (4.760)	-12.323 (9.689)
Pseudo R ²	0.41	0.18	0.25	0.31	0.50	0.51
Nobs	65	65	39	63	63	40

Source: Author’s computation.

*** (resp. **, *) = significant at the 1% (resp. 5%, 10%) threshold; standard deviations between brackets.

To test the robustness of our results, we have introduced a number of control variables, based on the observations made in the previous section. Given the modest size of our sample, we cannot introduce more than one supplementary control variable at a time, and in several instances one or the other of our core explanatory variables loses significance. However, the overall picture is unchanged. With respect to the control variables, only the financial depth variable is significant, as shown in equation [5]. It should be noted however that there is a relatively high correlation between financial depth and life expectancy, which may be due to a positive impact of a higher life expectancy on the demand for financial savings instruments. Consequently the parameter estimate for financial depth is rather fragile.

7- More recent take-off experiences

The principal lesson that we can derive from the previous findings for today’s countries who are candidates to emergence is that there are good reasons to be optimistic. In many countries, variables such as life expectancy, the demographic transition and education performances are much more favourable now than they were in the 1950s. A simple way to develop this argument is to use the previous equations to “predict” the probability of emergence of poor economies in more recent years. We have done such an exercise for the years 1980 and 2000. This exercise shows that for about half of our sample of poor non-emerging economies, a mechanical use of our equation (4) implies a high probability of emergence in 1980 and/or in 2000. Table 9 shows also that poor economies with a high probability of emergence in 1980 have experienced a higher growth than the others.

Table 9: Test of comparison of growth performances of economies with a high vs. low probability of emergence

probability threshold	Number of economies above threshold (on a total of 53)	average economies with high probability of emergence	average economies with low probability of emergence	difference	standard error of difference
90%	19	1.1	-0.1	1.4	0.5 **
80%	24	1.0	-0.1	1.0	0.6 *
70%	28	0.8	-0.3	1.1	0.5 **

Source: Author’s computations based on GGDCCB. Growth is computed from 1980 to 2005, or to the latest date available.

*** (resp. **, *) = significant at the 1% (resp. 5%, 10%) threshold.

This simulation is however too optimistic. In the early 1980s, many poor developing countries were hit by a major external debt crisis that was unprecedented in the post-WWII period. Consequently, only few economies emerged over the 1980s and 1990s, which have been lost decades for most of the African continent in particular. Among economies that started emerging since the 1980s, the most prominent ones are China, India, Vietnam, Cambodia and Bangladesh, which have grown since 1980 at a pace higher than 2 percent per year, on a per capita basis. Conversely, none of the countries for which our model predicts a relatively low probability of emergence in 1980 and in 2000 has grown fast since 1980.

These results suggest that improvements in the health, demographic and education variables that played a critical role in the emergence of emerging economies in the 1960s are still pre-conditions of economic emergence of today’s poor countries. But they are not sufficient conditions. Apart from the Philippines, Asian economies have avoided to a large extent the 1980s debt crisis, for having accumulated much less external debt than African and Latin

American countries, and they have been therefore in a much better condition than the latter to reap benefits from improvements in pre-conditions of emergence. Sound macroeconomic management and cautious financial policies have also certainly played a role in the new emergence of China and a few other Asian economies since 1980.

8- Conclusion

In conclusion, we have proposed a method to detect equilibrium jumps in economic growth patterns. Using this method, we have shown that emergence from development trap is actually observable in historical data of a dozen of economies that were among the poorest in the world until the 1950s. Most of these economies are Asian economies that have started a high growth process in the 1960s. A common characteristic of their growth processes is that they have experienced multiple growth peaks, with several alternating episodes of growth acceleration and deceleration, while non-emerging economies have experienced only one phase of growth acceleration, or none.

Emerging economies, compared to non-emerging economies that were equally poor in 1950, had in the 1950s and early 1960s some peculiar characteristics. Comparing the two groups of countries provides stylised facts that help identification of variables that may have played a critical role in the economic take-off of the emerging economies. The principal set of such variables is related to health and demography: emerging economies were precociously characterized by higher life expectancy, lower infant mortality, and lower fertility rates. Such factors facilitated economic emergence not only through direct interactions between health and productivity but also through the demographic transition.

A second major variable, education, is also identified as partially responsible for the economic take-off of emerging economies. Their progresses in education are due both to ambitious education policies that were launched in the 1950s and to the positive effects of better health conditions on returns to education, and hence on the demand for education.

In spite of recent cases of successful economic take-offs, notably in China and a few other Asian economies, contemporaneous improvements elsewhere in health, demographic and education variables have not stimulated economic growth as much as what could have been expected. One major reason for that has been the external debt crisis, which has interrupted economic and social progress in most of African and Latin American countries for about two decades since 1980. The eventually successful treatment of the debt crisis should now put these economies in a better position to take-off, but one should not be too optimistic given that in a large part of the African continent the HIV/AIDS crisis has recently led to a significant reversal of previous improvements in health conditions.

References

Acemoglu, Daron, and Simon Johnson. 2006. "Disease and Development: The Effect of Life Expectancy on Economic Growth." Mimeo, MIT.

Acemoglu, Daron, James A. Robinson and Simon Johnson. 2001. "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review* 91(5):1369-1401.

- Azariadis, Costas, and Allan Drazen. 1990. "Threshold Externalities in Economic Development." *Quarterly Journal of Economics* 105 (2): 501–26.
- Barro, Robert J., and Jong-Wha Lee. 2001. "International Data on Educational Attainment: Updates and Implications." *Oxford Economic Papers* 53(3): 541-63.
- Berthélemy, Jean-Claude. 2006. "To What Extent are African Education Policies Pro-poor?" *Journal of African Economies* 15(3): 434-69.
- Berthélemy, Jean-Claude, and Aristomene Varoudakis. 1996. "Economic Growth, Convergence Clubs, and the Role of Financial Development." *Oxford Economic Papers* 48 (2): 300–28.
- Bhargava, Alok, Dean T. Jamison, Lawrence J Lau, and Christopher J. L. Murray. 2001. "Modeling the effects of health on economic growth." *Journal of Health Economics* 20(3): 423-40.
- Bloom, David E., David Canning, and Pia Malaney. 2000. "Demographic Change and Economic Growth in Asia." *Population and Development Review* 26(supplement): 257–90.
- Chatterji, Monojit. 1992. "Convergence Clubs and Endogenous Growth." *Oxford Review of Economic Policy* 8 (4): 57–69.
- Collier, Paul. 2006. "African Growth: Why a 'Big Push'?" *Journal of African Economies* 15(Supplement 2):188-211
- Commission for Africa. 2005. "Our Common Interest – Report of the Commission for Africa. London.
- Durlauf, Steven N., and Paul A. Johnson. 1995. Multiple Regimes and Cross-Country Growth Behavior." *Journal of Applied Econometrics* 10 (4): 365–84.
- Easterly, William, and Ross Levine. 1997. "Africa's Growth Tragedy: Policy and Ethnic Divisions". *Quarterly Journal of Economics* 112(4):1203-50.
- Feenstra, Robert C., Dorsati Madani, Tzu-Han Yang, and Chi-Yuan Liang. 1999. "Testing Endogenous Growth in South Korea and Taiwan." *Journal of Development Economics* 60 (2): 317–41.
- Hausmann, Ricardo, Lant Prichett, and Dani Rodrick. 2005. "Growth Accelerations." *Journal of Economic Growth* 10(4): 303-329, 2005.
- Heston, Alan, Robert Summers, and Bettina Aten. 2002. "Penn World Table Version 6.1". Center for International Comparisons at the University of Pennsylvania (CICUP). http://pwt.econ.upenn.edu/php_site/pwt_index.php
- Hodrick, Robert J., and Edward C. Prescott. 1997. "Postwar U.S. Business Cycles: An Empirical Investigation." *Journal of Money, Credit and Banking* 29 (1): 1–16.

- Imbs, Jean, and Romain Wacziarg. 2003. "Stages of Diversification." *American Economic Review* 93 (1): 63–86.
- Krueger, Anne O. 1993. "Virtuous and Vicious Circles in Economic Development." *American Economic Review* 83 (2): 351–55.
- Lee, Chung H. 1995. *The Economic Transformation of South Korea: Lessons for the Transition Economies*. Paris: OECD.
- Leibenstein Harvey. 1954. *Theory of Economic-Demographic Development*. Princeton, NJ: Princeton University Press.
- Maddison, Angus. 2003. *The World Economy: Historical Statistics*. Paris: OECD.
- Mayer-Fooulkes, David. 2003. "Convergence Clubs in Cross-Country Life Expectancy Dynamics. in Rolph van der Hoeven and Antony Shorrocks (ed.), *Perspectives on Growth and Poverty*. Helsinki: UNU/WIDER: 144-71.
- Myrdal, Gunnar. 1968. *Asian Drama: An Inquiry into the Poverty of Nations*. New York: Twentieth Century Fund.
- Nelson, Richard. 1956. "A Theory of the Low-Level Equilibrium Trap in Underdeveloped Economies." *American Economic Review* 46 (5): 894–908.
- Nurkse, Ragnar. 1953. *Problems of Capital Formation in Underdeveloped Countries*. Oxford: Basil Blackwell.
- Quah, Danny T. 1997. "Empirics for Growth and Distribution: Stratification, Polarization, and Convergence Clubs." *Journal of Economic Growth* 2 (1): 27–59.
- Romer, Paul. 1990. "Endogenous Technological Change." *Journal of Political Economy* 98 (5): S71–102.
- Rosenstein-Rodan, Paul. 1943. "Problems of Industrialization of Eastern and South-Eastern Europe." *Economic Journal* 53 (210/211) : 202–11.
- Sachs, Jeffrey D., John W. McArthur, Guido Schmidt-Traub, Margaret Kruk, Chandrika Bahadur, Michael Faye, and Gordon McCord. 2004. "Ending Africa's Poverty Trap." *Brookings Papers on Economic Activity* 2004 (1) : 117–240.
- Solow, Robert M. 1956. "A Contribution to the Theory of Economic Growth." *Quarterly Journal of Economics* 70 (1): 65–94.
- Tirole, Jean. 1996. "A Theory of Collective Reputations (with Applications to the Persistence of Corruption and to Firm Quality)." *Review of Economic Studies* 63 (1): 1–22.
- UNESCO (United Nations Educational, Scientific and Cultural Organization). 1955. *World Survey on Education*. Paris.