# Chapter 2

# Disappointments in economic development

## 2.1 Stylised facts

WHY are so many countries still so poor? Citizens of the world's poorest country, Tanzania, have to live on $493 each, while those of the richest country, Luxembourg, enjoy a tasty GDP per capita roughly 80 times this amount: $39,129 (table 2.1). This sad record is not restricted to Africa. Many countries in Asia, the Caribbean, Latin America, Eastern Europe, and elsewhere have also failed to catch up. That is why development economics is still high on the agenda.

Table (2.1) summarises growth rates and incomes for the five richest and five poorest countries of 1960. It is striking that all of the rich countries grew faster than the poor (only Switzerland grew slower than Uganda). Instead of convergence, the income disparity between these countries increased. In 1960 Swiss income per head (then the highest) surpassed Tanzania's by factor 30 rather than factor 80 as described above. It makes little sense to consider today's richest and poorest countries unless economic performance over a period of time is taken into account. The wealthiest might be rich because of high growth and the poorest countries poor because of low growth. However, between 1960 and 1998 little changed. Three out of five countries remained the same in each group. Only Norway (oil) and Singapore (tidiness) could sneak into the wealthy club; while Madagascar and Zambia qualified with an exceptionally bad performance even for the lowest income group (-1.44 and -1.87 percent average annual growth, respectively). Tanzania is the poorest country now and then. Sub-Saharan Africa does not only have

Table 2.1: **Convergence? The five richest and poorest countries in 1960**

| Country | GDP per capita 1960 (in 1996 US$) | GDP per capita 1998 | Average annual growth rate (%) |
|---|---|---|---|
| Switzerland | 15,214 | 25,156 | 1.33 |
| United States | 12,821 | 31,049 | 2.35 |
| Luxembourg | 11,715 | 39,129 | 3.22 |
| Australia | 10,484 | 23,436 | 2.14 |
| Canada | 10,399 | 24,480 | 2.28 |
| Burundi | 587 | 962 | 0.50 |
| Uganda | 570 | 978 | 1.43 |
| Ethiopia | 560 | 643 | 0.36 |
| Malawi | 556 | 778 | 0.89 |
| Tanzania | 452 | 493 | 0.23 |

Source: Penn World Tables Version 6.1 (2002)

most of the poorest countries, they also grew slowest during the past 40 years. The Central African Republic lost close to 2 percent of GDP per capita each year since independence in 1960. The growth stars have mostly been in South Asia with Singapore leading at 6.86 percent annual growth, followed by Taiwan, South Korea, and Hong Kong. However, Sub-Saharan Africa also hosts the number five performer: Striving Botswana enjoyed close to 5 percent growth annually between 1960 and 1998. The fact that a country is located in Africa does not necessarily condemn it to dismal economic performance (figures taken from the Penn World Tables by Heston, Summers, and Aten, 2002).

Low-income countries are not only found in Africa or the Caribbean, but also just next door to Europe. Crossing the border from wealthy Austria to neighbouring Hungary means that per capita GDP is more than halved; from $21,969 to $10,331 (1998 figures). Crossing the border from Hungary to its neighbour Romania result in another major fall in income from $10,331 to $4,762; which is still twice the amount of Romania's neighbour, Moldova, whose people lives with on a GDP per capita as little as $2,423. Hence, less than 1,000km east of Vienna incomes are dwarfed to a mere fraction: Austrians are nine-times richer than the average Moldovan.

Global income distribution figures show a strong dispersion, and on several counts this dispersion is increasing rather than decreasing. One study argues that the ratio of GDP per capita between the richest and poorest countries increased to 45.2 in 1990, up from 8.7 in 1870 (Pritchett, 1997).

The picture, however, may be not all bleak. Numbers of people living

in poverty—ie, with a daily income of less than $2 in 1985 prices—and extreme poverty (less than $1 per day) have been declining in relative and absolute terms. Between 1976 and 1998, the number of people living under $1 a day declined by 235 million; the number of people living under $2 a day declined by 450 million over the same period. By 1998, less than 20 percent of the world population—some one billion people—lived below the $2-level, while some 350 million—slightly less than 7 percent of the world's population—lived beneath the $1-line (Sala-i-Martin, 2002).

Other studies agree with this trend, but put the figures much higher: Chen and Ravallion (2001) find that close to 1.2 billion people live below $1 a day and more than 2.8 billion live below $2 a day (Chen and Ravallion, 2001, p 290). One of the reasons behind the discrepancy is that Messrs Chen and Ravallion focus on consumption poverty while Mr Sala-i-Martin uses income poverty. Incomes are higher than consumption if poor people are able to save. Furthermore, Messrs Chen and Ravallion use household surveys while Sala-i-Martin applies data from national accounts, and both sources have produced data which is mutually contradictory (see Deaton, 2004; The Economist, 2004b, for a discussion).

Unanimity exists with regard to regional developments. Africa is the worst performer; the poverty rate climbed from 22 to 40 percent between 1970 and 1998, and most poverty is concentrated in Sub-Saharan Africa (Sala-i-Martin, 2002). This finding coincides with the dismal growth record of this region, illustrated in table 2.1. Mr Sala-i-Martin concludes that, "the welfare implication of finding out how to turn around the growth performance in Africa are so staggering, that this has probably become the most important question in economics" (2002, p 26).

On the other side of the spectrum are the East Asian growth stars, which experienced remarkable reductions in poverty together with strong growth (see above). In particular the populous countries, China, India, and Indonesia account for the bulk of poverty reduction in Asia. With growth rates between 2.65 (India) and 4.13 percent (China) over the period between 1960 and 1998, they may not have been the top performers in absolute terms, but nevertheless showed robust growth. If, for instance, China was excluded from the poverty count, the total number of poor people ($1-level) would have increased rather than decreased (Chen and Ravallion, 2001, p 290). The strong performance of these countries, China in particular, is also responsible for another phenomenon: Growth in real per capita GDP seems to be positively correlated with initial levels of GDP across a broad sample of countries where each country is given the same weight. This means that initially poorer countries tend to grow slower than initially richer countries,

thus aggravating the differences and pointing to a divergent development in world prosperity. If, however, countries are weighted by their population, and thanks to the robust performance of China and India with their vast populations, a negative relation between growth and initial GDP appears (Heston, Summers, and Aten, 2002; The Economist, 2004b). The concepts of unconditional and conditional convergence will be detailed in section (2.2), but it seems, that the notion of a converging world economy hinges on the performance of the two most populous countries, India and China. The latter in particular seems to be an exceptional case, whose lessons are hardly transferable to other developing countries—and nor should they be. Moreover, with GDP growth currently hitting 10 percent, China may be on the verge of overheating.

The overall picture seems to be that a substantial number of developing countries have managed to achieve robust growth rates and reduce poverty during the past few decades. These countries apparently succeeded with "take-off" (using the classical Rostow term) and some of them ceased to be considered developing as the $21^{st}$ century dawned and have joined the club of mature economies. Other countries, mainly in Sub-Saharan Africa and to a lesser extent in Eastern Europe and Central Asia, have stagnated and experienced deteriorating poverty levels.

Such a diverging development among the group of initially poor countries is often referred to as 'twin peaks' (see Quah, 1996). The basic idea is that countries that share similar fundamental factors, such as geography, culture or climate, should converge to roughly the same long-term level of income. However, the notion of twin peaks allows that countries may cluster around several income levels (a high-income level and a low-income level, for instance), despite their fundamental similarities.[1] Economic development may result in multiple equilibria. Charles Jones gives an illustration of such a process by comparing world income distribution statistics for 1960 and 1997 (relative to the US). He shows that while the distribution as a whole has become more even, the situation for the poorest countries has become worse: middle- and high-income countries seemed to catch-up while the poorest were lacking behind even more, at least in relative terms (Jones, 2002, p 74).

Multiple equilibria are easily derived if feedback loops are taken into account. Economic development may take the form of a catalytic process, with

[1]Section (2.2) discusses in more detail whether fundamental differences or multiple equilibria may better explain the observed pattern. Empirical evidence points to poverty or development traps as a consequence of multiple equilibria as the preferred explanation (Graham and Temple, 2001; Bloom, Canning, and Sevilla, 2003).

upward and downward spirals. Consider, for instance, the role of infrastructure, human capital, or good institutions: all of these are widely regarded as prerequisites and supporters of economic growth. Since roads, education, and law enforcement are expensive, they are not only the only sources of development but also its outcome, because more affluent countries are more likely to be able to afford them. Hence, economic development may jump on a self-reinforcing track; if successful, initial proceeds may be used to improve roads, schools, universities et cetera which in turn may accelerate development in terms of GDP per capita . The model introduced in chapter (6) applies a similar idea with regard to the quality of institutions.

## 2.2 $\beta$- and $\sigma$-convergence

The seminal growth models by Robert Solow (1956) and Trevor Swan (1956) are widely popular among development economists.[2] It starts with a basic production function, where Output, $Y$, is produced with production inputs capital, $K$, and labour, $L$:

$$Y = F(K, L) \tag{2.1}$$

Usually constant returns to scale are assumed, thus, it is possible to rewrite the above equation in per worker terms, with $y \equiv \frac{Y}{L}$ as per worker output and $k \equiv \frac{K}{L}$ as the capital endowment per worker—ie, the capital density:

$$y = f(k) \tag{2.2}$$

Changes in the stock of capital result from gross investments, $I$, less depreciations, $\delta K$. In a closed economy, gross investments equal savings—ie, $I \equiv sf(k)$, with $s$ being the savings rate. Population growth is denoted by $n = \frac{\dot{L}}{L}$.

$$\dot{K} = I - \delta K \tag{2.3}$$

$$\frac{\dot{K}}{L} = sf(k) - \delta k \tag{2.4}$$

$$\dot{k} \equiv \frac{\mathrm{d}(K/L)}{\mathrm{d}t} = \frac{\dot{K}}{L} - nk \tag{2.5}$$

$$\dot{k} = sf(k) - (n + \delta)k \tag{2.6}$$

[2]This section follows Barro and Sala-i-Martin (1995, pp 19-38).

Equation (2.6) describes the fundamental adjustments in the Solow-Swan model. The capital density expands when savings surpass effective depreciation $(n+\delta)k$. The steady state is defined as the equilibrium where $\dot{k} = 0$—ie, where savings equal effective depreciations. The corresponding value for the capital density is denoted with $k^*$, the steady-state output per capita is denoted with $y^*$:

$$sf(k^*) = (n+\delta)k^* \tag{2.7}$$

The growth rate of the capital endowment per worker, $\hat{k} = \frac{\dot{k}}{k}$, depends negatively on the level of $k$.

$$\hat{k} = \frac{\dot{k}}{k} = s\frac{f(k)}{k} - (n+\delta) \tag{2.8}$$

$$\frac{\partial \hat{k}}{\partial k} = s\frac{\left(f'(k) - \frac{f(k)}{k}\right)}{k} < 0 \tag{2.9}$$

Equation (2.9) shows that, other things equal, countries with a lower capital density tend to have higher growth rates in capital per worker, and thus in output. Countries with similar parameters $s$, $n$, and $\delta$, as well as similar production functions, $f(\cdot)$, have similar steady states values of $k^*$ and $y^*$. If the only difference were in the initial capital endowment per capita, then equation (2.9) suggests that less advanced economies grow at a higher speed than the more advanced countries. Countries which only differ with respect to their initial capital density will converge—ie, the poorer starters will eventually catch-up with the rich ones.

This concept is called conditional convergence, because only those countries are expected to converge which share otherwise similar characteristics. Let me consider an example with Cobb-Douglas technology, though without technological progress: $y = k^\alpha$. Thus, equation (2.6) can rewritten as:

$$\hat{k} = sk^{-(1-\alpha)} - (n+\delta) \tag{2.10}$$

$$s = \frac{\mathrm{d}k}{\mathrm{d}t}k^{-\alpha} + (n+\delta)k^{1-\alpha} \tag{2.11}$$

With $\nu \equiv k^{1-\alpha}$:

$$s = \frac{1}{1-\alpha}\frac{\mathrm{d}\nu}{\mathrm{d}t} + (n+\delta)\nu \tag{2.12}$$

The solution to this first-order differential equation can be obtained as follows:

$$\frac{\mathrm{d}\nu}{\mathrm{d}t} + \underbrace{(1-\alpha)(n+\delta)}_{\beta}\nu = s\,(1-\alpha) \tag{2.13}$$

Multiplying both sides of (2.13) with $e^{\beta\,t}$ and integrating:

$$\int \left[\frac{\mathrm{d}\nu}{\mathrm{d}t} + \beta\,\nu\right] e^{\beta\,t}\mathrm{d}t = \int s(1-\alpha)e^{\beta\,t}\mathrm{d}t \tag{2.14}$$

$$\text{with: } \left[\frac{\mathrm{d}\nu}{\mathrm{d}t} + \beta\,\nu\right] e^{\beta\,t} = \frac{\mathrm{d}(\nu\,e^{\beta\,t} + b_0)}{\mathrm{d}t}$$

$$\nu\,e^{\beta\,t} + b_0 = \frac{1}{\beta}s\,(1-\alpha)e^{\beta\,t} \tag{2.15}$$

$$\nu \equiv k^{1-\alpha} = \frac{1}{\beta}s\,(1-\alpha) - e^{-\beta\,t}\,b_0 \tag{2.16}$$

The constant $b_0$ can be determined by using $k = k(0)$ at $t = 0$, hence:

$$b_0 = \frac{1}{\beta}s\,(1-\alpha) - k(0)^{1-\alpha}$$

Using $\beta = (1-\alpha)(n+\delta)$:

$$\nu \equiv k^{1-\alpha} = \frac{s}{n+\delta} + \left(k(0)^{1-\alpha} - \frac{s}{n+\delta}\right) e^{-(1-\alpha)(n+\delta)t} \tag{2.17}$$

From equation (2.7) follows that in steady state $k^{1-\alpha} = \frac{s}{n+\delta}$. Hence, equation (2.17) says that the gap between the current value $k^{1-\alpha}$ and the steady state value $\frac{s}{n+\delta}$ is reduced with the constant rate $\beta = (1-\alpha)(n+\delta)$. The coefficient $\beta$ indicates the speed of convergence from $k$ to $k^*$, and because of $\hat{y} = \alpha\hat{k}$ it gives also the convergence speed of output per worker, $y$. Using (2.10):

$$\hat{k} = sk^{-(1-\alpha)} - (n+\delta)$$

$$\hat{k} = \frac{\mathrm{d}\,\log k}{\mathrm{d}t} \approx -\beta \log\left(\frac{k}{k^*}\right) \tag{2.18}$$

The actual speed of convergence is not constant; it depends on the distance to steady state. The growth rate of $y$ may be written as:

$$\hat{y} = \alpha \left( s y^{\frac{-(1-\alpha)}{\alpha}} - (n+\delta) \right) \tag{2.19}$$

$$\hat{y} = \alpha (n+\delta) \left[ \left( \frac{y}{y^*} \right)^{\frac{-(1-\alpha)}{\alpha}} - 1 \right] \tag{2.20}$$

$$\beta = -\frac{\mathrm{d}\hat{y}}{\mathrm{d}\ \log y} = (1-\alpha)(n+\delta) \left( \frac{y}{y^*} \right)^{\frac{-(1-\alpha)}{\alpha}} \tag{2.21}$$

In steady state, with $y = y^*$, the value for $\beta$ as given above holds: $\beta = (1-\alpha)(n+\delta)$. $\beta$ decreases with rising $\frac{y}{y^*}$. Hence, $\beta = (1-\alpha)(n+\delta)$ is an approximation which holds in an environment around the steady state.

If $\beta$ were 0.05 for instance, then each year the gap between current output per worker, $y$, and steady state output, $y^*$, would be closed by 5 percent. It would take 14 years to close the gap by half.[3] If one includes technological progress, then $\beta$ would be determined by

$$\beta = (1-\alpha)(\hat{A} + n + \delta), \tag{2.22}$$

with $\hat{A}$ being the growth rate of the level of technology, $A$ (Barro and Sala-i-Martin, 1995, pp 43-62). Because the coefficient which indicates the speed of convergence is labelled $\beta$ the catch-up of less advances economies is often called $\beta$-convergence. Apparently, $\beta$ does not depend on the savings rate, $s$, or the level of technology, $A$, though both speed up capital accumulation. They also induce a counter-veiling effect in that they increase the steady-state values of the capital density, $k^*$, which means that the average productivity of capital becomes lower close to the steady state.

Related to the concept of $\beta$-convergence is the idea of $\sigma$-convergence, which focuses on the variance of per-capita incomes across countries, rather than the catch-up of individual candidates. Even absolute $\beta$-convergence—ie, the convergence towards a joint steady state—does not guarantee that the variance in per-capita incomes will be reduced, because shocks and disturbances will generate new dispersion.

Consider a large group of economies, where the development of yearly per-capita incomes for economy $i$ may be described as below, with $a$ and $b$ as constants with $0 < b < 1$:

[3] Please note that $e^{-\beta t} = \frac{1}{2}$, thus $t = -\frac{\log(1/2)}{\beta} \approx 13.86$.

$$\log y_{it} = a + (1 - b) \log y_{i,\,t-1} + u_{it} \tag{2.23}$$

For $b > 0$ the above equation implies absolute convergence, because the growth rate of output correlates negatively with $\log y_{i,\,t-1}$. The disturbance term $u_{it}$ captures temporary shocks to the economy and is assumed to have an expected value of zero and a variance, $\sigma_u^2$, equal to all economies.

The variance of a sample of countries is taken as a measure of dispersion

$$D_t = \frac{1}{N} \sum_{i=1}^{N} [\log\, y_{it} - \mu_t]^2, \tag{2.24}$$

with $N$ as the number of countries in the sample, and $\mu_t$ as the average of $\log\, y_{it}$ in the sample. As an approximations to the dispersion of per-capita incomes across time the formulae below may be used, as long as the number of observations is high. Using (2.23) in (2.24):

$$D_t \approx (1 - b)^2 D_{t-1} + \sigma_u^2$$

The long-term equilibrium ($D_t = D_{t-1} = D^*$) is characterised by:

$$D^* = \frac{\sigma_u^2}{1 - (1 - b)^2} \tag{2.25}$$

The dispersion in long-term equilibrium, $D^*$, drops in $b$ but rises in $\sigma_u^2$. A dispersion will remain, $D^* > 0$, even if absolute convergence holds ($b > 0$), given that the variance of the disturbance terms is positive, $\sigma_u^2 > 0$ (see Barro and Sala-i-Martin, 1995, pp 36-38, for details). Even if one were to assume absolute $\beta$-convergence, which is a stark assumption in itself, this would not necessarily imply that the distribution of world incomes would eventually become flat. This phenomenon is often illustrated with the ranking of football teams in a league. Top teams in one season often perform worse in the next seasons, while the worst teams of the previous season often improve; an effect of mean reversion, which is comparable to absolute $\beta$-convergence, because this season's performance depends negatively on last season's. The dispersion, however, always remains the same, because there will always be a 1st, and a 2nd, et cetera.

In economic development, $\sigma$-convergence—ie, the lack of—may be related to the phenomenon of *reversal of fortune*. Historical evidence suggests that a number of regions, which are now considered poor, have been among the top performers in economic prosperity some 500 years ago. If measured by the degree of urbanisation, the societies of the Mughals in India and

Aztecs in America were much richer in 1500 than were the now more affluent societies of North America or Australia (Acemoglu, 2003b, p 28; see also section 4.4.1).

Empirical evidence indicates that absolute $\beta$-convergence seems to take place within groups of rather homogeneous countries, such as the group of industrialised countries (Baumol, 1986), or the states within the US (Barro and Sala-i-Martin, 1995, p 33). For a large sample of heterogenous countries absolute $\beta$-convergence does not seem to hold, at least as long as countries are not weighted by population. Otherwise, the strong performance of China and India in particular would tip the verdict in favour of convergence.

If differences across countries are acknowledged, such as different saving rates or a varying levels of technology, conditional convergence requires that countries converge to their individual steady state; the faster the further they are away from it. Conditional converge is, thus, consistent with the impression that homogenous countries converge to single steady state (absolute $\beta$-convergence), but convergence may not be observed across a broad sample of heterogenous countries, for they may move to their individual, and probably widely dispersed, steady states.

The concept even of conditional $\beta$-convergence, however, struggles with explaining persistent poverty or development traps (cf section 2.1). The explanation offered is that countries move towards their individual steady state and do not necessarily converge absolutely. Country-specific characteristics determine the long-term steady state, and if these vary so may the steady states.

Various caveats may arise: The first is the sheer magnitude of differences in apparent steady states. While industrialised countries have reached per-capita incomes between \$20,000 and \$30,000 and keep growing, driven mainly by progress in technology, the poorest countries dwell well below \$1,000 and show modest growth if at all. Which country-specific characteristics best explain such a huge dispersion? Though few people would argue the fact that poor countries usually apply simpler technologies and probably save less (a high savings rate is often considered the privilege of the rich) it seems questionable whether these or other differences suffice to account for the huge discrepancies in wealth.

A second point is that it may be questionable to assume that country-specific characteristics remain constant over time. If certain features were considered responsible for a dramatically low steady-state income; there would be

an enormous incentive to change these. The experience in Eastern Europe is a telling example. When it became clear that the planned economy failed to produce similar prosperity as the market-based approach in the West, people started to demand a system change. Since they lacked proper democratic representation, the usual public-choice mechanism was out of work, which certainly delayed the transition. But the mounting pressure eventually got its way and culminated in the fall of the Berlin Wall in November 1989. Subsequently, the former Communist states of Eastern Europe embraced the market economy and started their often painful transition. If such an oppressive system can be overturned, why not other cultural, social, or otherwise binding features?

There are things which cannot be changed. Basical geographical characteristics, such as topography and climate, are usually out of reach, despite canals, irrigation, and the possible potential of prolonged $CO_2$-emissions for changing even this. In fact, there is a staggering correlation between incomes and distance to the equator, with the poorest countries being in the tropics around the equator. Empirical evidence, though, calls for some caution lest correlation be confused with causality, because several studies find that once other factors are controlled for, adverse geography ceases to be significant (see also pp 88-90 in this book). In particular, Bloom et al (2003) find that adverse geography does not determine a poverty trap. They nstead prefer a model with high- and low-income equilibria.

This is not to say that geography is irrelevant to the fate of modern economies. On the contrary, bad geographical externalities for instance in the form of diseases, still plague many developing countries (Sachs, 2003b,a). Moreover, many characteristics which now differentiate rich societies from poor may ultimately be traced back to differences in geography and resource endowments. Jared Diamond (1997) provides an intriguing explanation for the grand picture of today's distribution of incomes based on geographical factors. He argues that features such as the availability of domesticable wild plants and animals or the frequency of rainfall gave some early societies (starting some 13,000 years ago) a competitive edge, which can explain the way power and prosperity are distributed today. Acemoglu (2003b) and Acemoglu et al (2001) argue that high settler mortality, caused by frequent and lethal diseases, led to a different approach to colonisation in South America as compared to North America, which offered a more settler-friendly environment.

It is reasonable to assume that poor geography once determined certain characteristics, for instance exploitative institutions, which are now responsible for sluggish development. It is of course extremely difficult to change

geography, but it is sometimes possible to change some of the characteristics which are now responsible for low incomes and which were caused by bad geography. For example: Prior to colonisation, Australia was endowed with only few a animals and plants suitable for domestication, and hence, the step towards an agricultural society did not happen until after 1788 (Diamond, 1997). In terms of production per worker, Australia was surely behind its peers in Europe and Asia. This has not hindered Australia turning into the wealthy and industrialised country it is today. One of the reasons for Australia's success is that settlers imported the necessary ingredients for fruitful agriculture, and thus, were able to quickly overcome the initial handicaps created by climate and terrain. Hence, bad geography may once have determined a dismal economic situation, but it has become increasingly difficult to argue that it remains primarily responsible for the magnitudes in income differences observable across the world, once the exchange of goods, ideas, and services is allowed for.[4] This notion is supported by empirical evidence which suggests that, despite the strong correlation between incomes and geography (eg, distance to the equator), bad geography ceases to be significant once other variables are controlled for (eg Rodrik, Subramanian, and Trebbi, 2002).

## 2.3 A typical growth regression

It has been stated frequently that economic development is the exception rather than the rule (see for instance Mary Shirley, 2003, p 3, Mary Shirley is a long time World Bank practitioner). Developing countries outside East Asia and Southeast Asia do not seem capable of catching up (Azariadis, 2001, p 3, F6).[5] Despite years of foreign aid and ample research, no silver bullet has yet been found to bring prosperity on a large scale to the developing world. Although many solutions have been suggested.

Theoretical and empirical research produces numerous variables which are presumed to be responsible for economic success. Table (2.2) is an

[4] Again, this is not to reject the idea that geography is important to today's levels of income: Some countries do extremely well because of vast natural resources, others do rather bad despite vast resources (but presumably with bad institutions). Large distances to the main trading centres or frequent diseases certainly put a strain on economic activity. Hence, bad geography may lead to a lower steady-state income. The point is that it is hard to imagine that geography alone should be responsible for the magnitudes in income differences.

[5] Such a statement might be deceptive if it is targeted to country averages rather than the income positions within countries (see section 2.1).

excerpt from Barro and Sala-i-Martin (1995, pp 494-495; table 12.3), who empirically test the explanatory power of various variables, such as human-capital formation, political stability, and capital investments for the period between 1965 and 1985. Table (2.2) shows two estimations: the first column uses the method of seemingly unrelated equations (SUR), while the second column (INST) uses some of the original variables as well as lagged variables as instrumental variables. Unless stated otherwise, the following discussion will concentrate on the second column (INST).[6]

Conditional convergence says that countries which are far below their steady-state level of income should have higher growth rates. This is reflected by the variable log(GDP) which represents the level of real GDP per capita (in logarithms) at the beginning of the period under consideration, say 1965. The negative coefficient lends support to the hypothesis of conditional convergence because it says that countries grow faster the lower their original GDP per capita. This implicitly assumes that a low GDP also indicates a wider distance from steady state. A coefficient of -0.026 suggest a convergence of around 3 percent per year (Barro and Sala-i-Martin, 1995, p 501).

The variables which describe education—ie, secondary and higher schooling for men and women at the begin of the period (enrollment rates)—are significantly correlated with growth. The positive coefficient with male education seems to stress the importance of education for future growth. Section (3.4) returns to this point and argues that human capital, in the form of skilled workers, is necessary for technology diffusion. The negative coefficient with eduction for women is somewhat against the conventional wisdom. However, Barro and Sala-i-Martin (1995, p 501) argue that low education for women is another sign of underdevelopment. Low women's education figures at the the beginning of the considered period may reflect backwardness in other areas, and thus a higher potential for growth because of conditional convergence. Hence, the negative coefficient with women's education should not be interpreted in the sense that schooling women harms growth.

Life expectancy has a strong and significant correlation with growth. The strength of correlation suggests that life expectancy captures a number of factors, which are good for growth and health, such as improved working conditions.

[6]Please refer to Barro and Sala-i-Martin (1995, pp 488-517) for a more detailed presentation.

Public expenditure for education, $G^{education}/Y$, correlates significantly with growth. This reflects the positive relationship between education and growth, because higher education spending should improve enrollment rates and the quality of schooling. This result should be taken with care: although it indicates that public activity in order to promote education seems to pay off, the negative effect of government consumption, $G^{consumption}/Y$, calls for some caution. In fact, the variables for government consumption are stripped of expenditures for defense and education, so that there is no contradiction in results. However, the significant, negative coefficient of -0.11 illustrates the negative relation between public consumption and growth, in particular because high government consumption is often associated with an excessive bureaucracy, corruption, or distorting taxation. There is no reason to believe that these side-effects of government consumption would not appear with expenditures for education. The positive coefficient with $G^{education}/Y$ suggests that the net effect—ie, the positive effect on education minus those distortions which accompany public expenditure programmes—is still positive. But this may change once a state tries to push education further by initiating a huge programme. In a sense, the negative effect of government consumption limits the degree to which public education expenditures may be employed to promote human capital and growth.

Distortions by government intervention are also captured by the variable log(1+black-market premium), which measures the difference between official exchange rates, and the price paid on the (black) market. The size of the gap is seen as a proxy for general market distortions. If official and market rates differ widely it suggests that other markets fall prey to government induced distortions as well, which should reduce growth. Indeed, the coefficients are negative and significant.

Table 2.2: **Regressions of growth rates in real GDP per capita**

| Estimation method | SUR | INST |
|---|---|---|
| log(GDP) | -0.0254 | -0.0261 |
| | (0.0028) | (0.0031) |
| Education | | |
| men | 0.0134 | 0.0164 |
| *secondary education* | (0.0056) | (9.0058) |
| women | -0.0551 | -0.0090 |
| *secondary education* | (0.0068) | (0.0070) |
| men | 0.055 | 0.050 |
| *higher education* | (0.029) | (0.030) |
| women | -0.085 | -0.079 |
| *higher education* | (0.039) | (0.040) |
| log(life expectancy) | 0.058 | 0.064 |
| | (0.013) | (0.014) |
| $G^{Eduction}/Y$ | 0.062 | 0.229 |
| | (0.085) | (0.109) |
| $I/Y$ | 0.074 | 0.024 |
| | (0.020) | (0.028) |
| $G^{consumption}/Y$ | -0.060 | -0.113 |
| | (0.023) | (0.028) |
| log(1+black-market premium) | -0.0309 | -0.0299 |
| | (0.0047) | (0.0083) |
| political instability | -0.0286 | -0.0329 |
| | (0.0094) | (0.0183) |
| growth rate, | 0.130 | 0.108 |
| terms of trade | (0.036) | (0.038) |
| $R^2$ (number of | 0.65 (87) | 0.62 (87) |
| observations) | 0.54 (97) | 0.51 (97) |
| autocorrelation | 0.21 | 0.21 |
| coefficient | | |

The dependant variable is the growth rate of real GDP per capita according to Summers and Heston (1993). Standard errors are in parentheses.
Source: Barro and Sala-i-Martin (1995) pp 494-495; table 12.3

A number of studies, for instance Levine and Renelt (1992), find a positive relation between physical capital formation, $I/Y$, and growth. High net investments should increase the capital endowment per worker, and thus, contribute to growth in output per worker. Barro and Sala-i-Martin, though, come up with a mixed result, depending on the estimation method. Although, both methods show positive coefficients, in line with theoretical considerations and some previous studies, only the coefficient in the first column (SUR) is significant, while the other (INST) is not. Barro and Sala-i-Martin use the average investment rate five years before the period in question as instrument—ie, the average between 1960 and 1964 for the period between 1965 and 1975, respectively 1970-1974 for the period 1975-1985.

They attribute the positive and significant relation with the SUR regression to reverse causality—ie, that growth causes investments to rise, rather than the other way round. An "exogenous" variation in the investment rate, where all other variables are held constant does not have a significant influence on growth, as illustrated by the INST-regression. This suggest reverse causality. Moreover, the fact that important variables are held constant may eliminate the effect of investment on growth. For instance, withdrawing the life expectancy variable from the regression increases coefficients and significance with both methods to 0.058 (0.026) for the SUR-regression, and 0.099 (0.020) for the INST–regression. This suggests that investments have a positive impact on growth partly via improvements in life expectancy. If this is held constant, the transmission channel vanishes (Barro and Sala-i-Martin, 1995, pp 503-504).

The investment figures include private as well as public investments, although it is not clear whether both should have a similar productivity. Governments are not subject to the same hard budget constraints as private firms, hence they are more likely to channel money towards prestigious white elephants with little economic pay-off. Moreover, public investment programmes might invite corruption by bidding companies in order to win contracts, which additionally distort prices. Private firm, on the other hand, face usually hard budget constraints and invest only if they expect a positive net present value. This improves the efficiency of capital allocation. However, private firms are reluctant to invest in public goods such as education or infrastructure, which in turn are considered to be positively associated with growth. With regard to public investment there is a trade-off between the provision of necessary and useful public goods and the associated distortions. Disentangling investments into a private and a public part is difficult, because it is hard to obtain reliable and comparable data. Nevertheless, Barro and Sala-i-Martin (1995, pp 513-514) use the available data and find

that separating investments into a public and private part leaves results basically unchanged.

Political instability, as measured by the number of coups per year and political assassinations per million inhabitants per year, unsurprisingly has a negative correlation with growth. Since poor economic performance may also trigger political instability, the question of reverse causality is important. The INST-regression therefore, uses average five years before the period under consideration, in order to isolate the influence of political instability on growth, rather than the reverse. In doing so, the coefficient increase from -0.029 to -0.033, but so do standard errors from 0.0094 to 0.0183, which makes the coefficient of the INST-regression only weakly significant.

Finally, table (2.2) reports a positive and significant correlation between the growth rate of terms of trade—ie, the relation between export prices and import prices—and growth in real GDP per capita. An increase in the terms of trade increases a country's real income, which usually translates into higher consumption. The positive coefficients suggest, that production rises with terms of trade, too. However, the growth rate of terms of trade depends mostly on factors that are out of control of most small developing countries, and is therefore mostly exogenous.

A number of other variables may be included as well in growth regressions. The level of democracy may be considered an important ingredient of growth, because political freedom may encourage economically fruitful behaviour and limit government discretion in distorting the market. However Barro and Sala-i-Martin (1995, p 510) do not find a systematic relation between the level of political freedom, as measured by Gastil (1986), and growth. Democracy may still have a positive effect, but would be reflected by other variables, such as education or private investments.

The quality of institutions, as measured by the ICRG indicator, does have a positive and significant correlation with growth. But this deserves a more detailed presentation, which can be found in section (4.4).

Finally, the impact of public expenditures for defense and the participation in an external war may be considered. In the sample used in table (2.2), 39 percent of countries were involved in at least one external war. However, including a 0/1-variable for war returns a negative but insignificant coefficient, although it seems plausible to attribute a much greater and more pronounced effect to war. The insignificance found in the regression may rather reflect poor data, if only because statistical offices may lose priority

in times of war. Regressions which include a variable for defense spending find that the coefficient is close to zero (Barro and Sala-i-Martin, 1995, p 513).

## 2.4 Elusive development strategies

Growth regression such as (2.2) and many others are quite successful at explaining cross-country variations in growth. Nevertheless, attempts to craft development strategies out of these results has often served to disappoint. Otherwise, there would not be the dismal picture of sections (2.1) and (2.2) with many countries being persistently stuck in poverty. Apparently it is not so easy to exploit the correlations in order to overcome economic backwardness. One of the reasons is that correlations are just that: correlations. They do not prove causality.

Economic output is produced by combining input factors capital and labour using a certain level of technology or, more broadly, efficiency or total factor productivity. Output per worker can be increased if labour productivity rises. This can be realised by giving workers more capital to work with, by improving the efficiency with which their work at a given level of capital endowment is applied, or by increasing the effective supply of labour by improving education and health. At the end of day, all changes in economic output can be traced back to changes in either of the three factors, capital endowment per worker, human capital, and total factor productivity. Growth-accounting exercises attribute all changes in output which are not explained by variations in inputs to changes in total factor productivity, which thus assumes the role of a residuum. Poor countries which want to became rich must accumulate capital, physical as well as human, and/or improve total factor productivity. The controversial point is how to induce and manage these increases.

### 2.4.1 Deliberate capital formation: white elephants galore

It is tempting trying to force development by factor accumulation, physical and human, but the practical results have often been disappointing. Besides regressions, the idea of deliberate capital formation has received theoretical clout from part of the early development economics (see section 3.1) and is sometimes fashionable today, albeit that objecting views are more pronounced now (see Easterly, 1999, 2001, pp 47-70, for a critical stance).

A major problem of that process is that any industrialisation programme entails substantial agency costs, which may even outweigh the expected gains. Hence, developing countries do not only suffer from under-investment, but also from the wrong investments. Resource misallocation leads to lower total factor productivity, which crowds out the increase in input factors and leads to sluggish growth. Unless good institutions are in place, governments have leverage to pursue own goals in allocating funds, instead of investing into economically sensible projects. This explains the preference for prestigious projects with little or even negative social benefits, such as fancy bridges few want to use, or the hosting of major sporting events. State-owned entreprises may be found to offer employment for cronies and supporters rather than being profitable in the first place. The location of investments may be determined by political instead of economic reasons, for instance to favour a particular region. And the investment decisions may suffer from outright corruption and fraud, in the form of money or perks given to decision makers. Moreover, even if well-intended, they might lack the resources necessary for sufficiently informed choices (Stiglitz, 1992, p 46).

A number of studies documents the pervasive effect of agency costs on public investment decision in developing countries (cf Killick, 1978; Tangri, 1999). They also report many examples where politicians bluntly overturned negative economic assessments, based on cost-benefit analyses or plain common sense, and pursued their goals anyway. Prestige and political payoff seem to be the major determinants for the allocation of capital. The consequence is severe resource misallocation which shows in sluggish or declining total factor productivity.

This phenomenon is not limited to developing countries. The European Union hands out enormous amounts of money, a third of its budget, to regions with less than average per-capita incomes, in order to promote regional development and convergence. This money is called Structural Funds and has become a major bargaining instrument in European negotiations. However, Ederveen, de Groot, and Nahuis (2002) find that Structural Funds are conditionally effective only—ie, only those countries with good institutions succeeded in channelling the money into productive usages, while those with weaker institutions tend to suffer more from agency costs, and consequently experienced lower growth.[7]

[7]Ederveen, de Groot, and Nahuis (2002, p 15) find robust and significant conditional effectiveness of Structural Funds only for openness and direct measures of institutional quality, such as the corruption perception index and the ICRG index (see section 4.4 for more details on the empirics).

### 2.4.2 Education, education, education?

While industrial policy is slowly waning as a means to capital formation because the associated agency costs are too high, human capital formation is much more fashionable as a development tool, inside and outside the developing world. The appeal, again, is simple: An educated and healthy worker has a higher productivity than someone who is untrained and less healthy. Hence, education increases output per worker in the absence of countervailing forces. Lucas (1988, 1990) and Mankiw, Romer, and Weil (1992) are able to explain a large part of cross-country variations in per capita incomes by including measures for human capital in their calculations. They suggest that it is a lack of human capital which drives down returns to physical capital in poor countries. Therefore, little capital flows from rich to poor countries (rather the opposite direction).[8] The idea is that human capital and physical capital are complements, which together allow countries to catch up. In this spirit, Alwyn Young (1995) attributes the high growth rates in East Asia to the strong accumulation in human and physical capital.

The unequivocal support for educational programmes to increase human capital has come under attack from two sides. First, a number of countries failed to take advantage of rapid growth in human capital (eg, Ghana or Zambia), while others (eg, Japan) became growth miracles despite moderate growth in human capital (Easterly, 2001, p 74). Moreover, Eastern European countries did have a very sophisticated educational system with enrollment rates not much lower than in OECD countries. Nevertheless, this did not stop them from plunging into deep recessions after the beginning of transition from which some countries have not yet recovered. Second, Lant Pritchett (1997) finds that increases in educational capital had no positive impact on the growth rate of output per worker. He instead finds a large, significant and negative effect of growth in human capital on total factor productivity.[9]

There are basically two lines of argument which cast doubt on the ability to exploit an education-growth linkage, or even its existence. First, any public educational programme involves agency costs, similar to public industrial policy. Second, education might not be particularly helpful if demand for skilled workers is low.

The first line of arguments is based on similar caveats as that related to public industrial policy. Education can be regarded as a major industry

[8] See section (3.2) for details.

[9] The results are controversial, though. Krueger and Lindahl (1999), for instance, attribute Pritchett's findings to measurement errors.

which the government can use to pass jobs and orders to its cronies and clientele. Moreover, the public sector may appear as an employer of last resort which mops up otherwise unemployed workers. Pritchett and Filmer (1999) look at the micro-economics of eduction. They find that public education in poor countries is often biased towards "too many" teachers, while at the same time learning tools, such as pens, notepads, and textbooks are underrepresented. Such misallocations drive down the effectiveness of schooling, although they bloat the educational budget.

However, even if more money means more education—ie, if the agency costs are not paramount, this does not necessarily cause growth. In fact, Pritchett (1997) finds a negative relation between human capital accumulation and total factor productivity. He offers three explanations. First, it may be that schooling has little impact on productivity, because cognitive abilities are unaffected. Rather, schooling and education are signals to future employers showing that candidates are motivated and determined, which yields them a wage premium. Education is perhaps a luxury that people start enjoying once they are better off. However, this explanation is hardly convincing. Getting better paid jobs and having a decent lifestyle seem important motives for attending school and university. Moreover, if education did not raise productivity, at least potentially, how could one explain the extend of schooling and education in the developed world?

A second argument is that there are not enough jobs for trained and educated workers. If education programmes increase the supply of educated workers while demand remains stagnant, the result will be a lowering of the wage premium. This in turn may discourage others from investing time and money into education.

Finally, a related point. If educated workers do not find proper jobs, they might turn towards unproductive and wasteful activities, such as lobbying the government and searching for one of the clientele jobs in the bloated bureaucracy or overmanned state enterprises.

If lack of human capital were be responsible for sluggish development, then marginal returns to education should be high, because scarcity drives up prices. Paul Romer (1995) calculates that the assumptions applied by Mankiw et al (1992) implied that wages for skilled workers in some poor countries, say India, should be much higher than in skill-abundant, rich countries such as the United States. Such wage differentials should trigger migration by skilled workers from the US to India, while skilled Indians

should be expected to stay.[10] Alas, it is usually the most talented and best educated people who migrate from poor to rich countries; a phenomenon often termed 'brain drain'. Wage differentials are only one motivation for migration. Skilled workers may have a superior ability to move abroad, because they are more likely to master the organizational effort and to be better able to integrate into a new society. This may explain the undue share of skilled workers in labour flows from poor to rich countries, but it does not explain why skilled workers should move in the first place, or why skilled workers from rich countries do not move to poor countries. Perhaps, wage differentials are not as implied by Mankiw et al. Indeed, on most accounts, even trained and skilled personal in poor countries earn less than with comparable positions in rich countries.

Summing up, there is little dissent that economies with better trained and educated people and more physical capital per worker—ceteris paribus—have a higher output potential than an economy which scores lower on both accounts. The question is how to master an increase without sacrifices in efficiency. Public investment programmes in either machines and education may easily fall prey to soaring agency costs which eat up most (or even more) of the potential gain. If the rules that govern the allocation of resources are distorted and biased towards unproductive activities, more input can result in less output. This is the experience of many poor countries which suffered from low growth rates despite substantial investments in physical and human capital.

Many authors, including (Pritchett, 1997; Ederveen, de Groot, and Nahuis, 2002), suggest that it takes good institutions to make physical and human capital accumulation successful, because these reduce the amount of agency costs.

## 2.5 Empirics of development traps

Multiple equilibria are a powerful instrument for explaining the apparent failure of some countries to catch-up to the high income levels of mature economies. Robert Solow speculates that a balanced growth path towards a unique steady state may not be the only possibility, but that an economy may converge towards multiple steady states (Solow, 1956, pp 71-72). By the same token, early authors of the Big-Push emphasised the importance

[10] Mankiw, Romer, and Weil (1992) assume that only physical capital would be internationally mobile, while labour is not.

of thresholds in economic development: countries below this threshold converge to a low-income steady-state, while those above the threshold converge to a high-income steady-state (see section 3.1). From a methodological point of view, the idea of multiple equilibria is probably too simple an explanation for economic development. As Paul Krugman puts it:" Thou shalt not multiply equilibria unnecessarily!"[11] Therefore, this section reports on the empirical appeal multiple equilibria and development traps have in explaining the distribution of rich and poor nations. A convincing account that the distribution is indeed characterised by multiple equilibria would be an encouragement to look for theoretical explanations which include poverty or development traps.

First evidence on development traps can be taken from kernel density estimates of relative incomes as illustrated in figure (2.1). The horizontal axis indicates national income vis-à-vis average income, so a value of less than one means that a country's income is below average. The distributions show twin peaks in the form of local maxima of the density function. In 1960, there are local maxima at relative incomes of around 0.3 and 1.3. Until 1985 the gap between maxima has widened to 2.4 because the high-income maximum has moved to 2.7. Moreover, it can be seen from (2.1) that there is a large group of poor countries and a small group of rich countries (Semmler and Ofori, 2003, p 24). Between 1960 and 1985, the gap between these groups apparently increased which supports the notion of a partly divergent development as introduced in section (2.1). Finally, it shows that the twin-peaks pattern became more pronounced in 1985 compared to 1960, as the variance around the high-income cluster became smaller. Danny Quah (1996, 1997) describes this as the *emergence of twin peaks* because polarisation and development within convergence clubs seems to have increased over time.

The pattern in figure (2.1) does not necessarily need multiple equilibria for explanation. Other forces could be at work. But it is increasingly difficult to argue that differences in fundamentals are responsible for such a neat distribution.

In a fascinating paper, Bryan Graham and Jonathan Temple (2001) attempt to estimate the empirical relevance of models with development traps. They use a two-sector model, with agricultural and non-agricultural production. The non-agricultural sector includes a simple positive externality in

[11] Taken from Krugman, Paul (1999), "TIME ON THE CROSS: CAN FISCAL STIMULUS SAVE JAPAN?", available at http://www.pkarchive.org/japan/scurve.html.

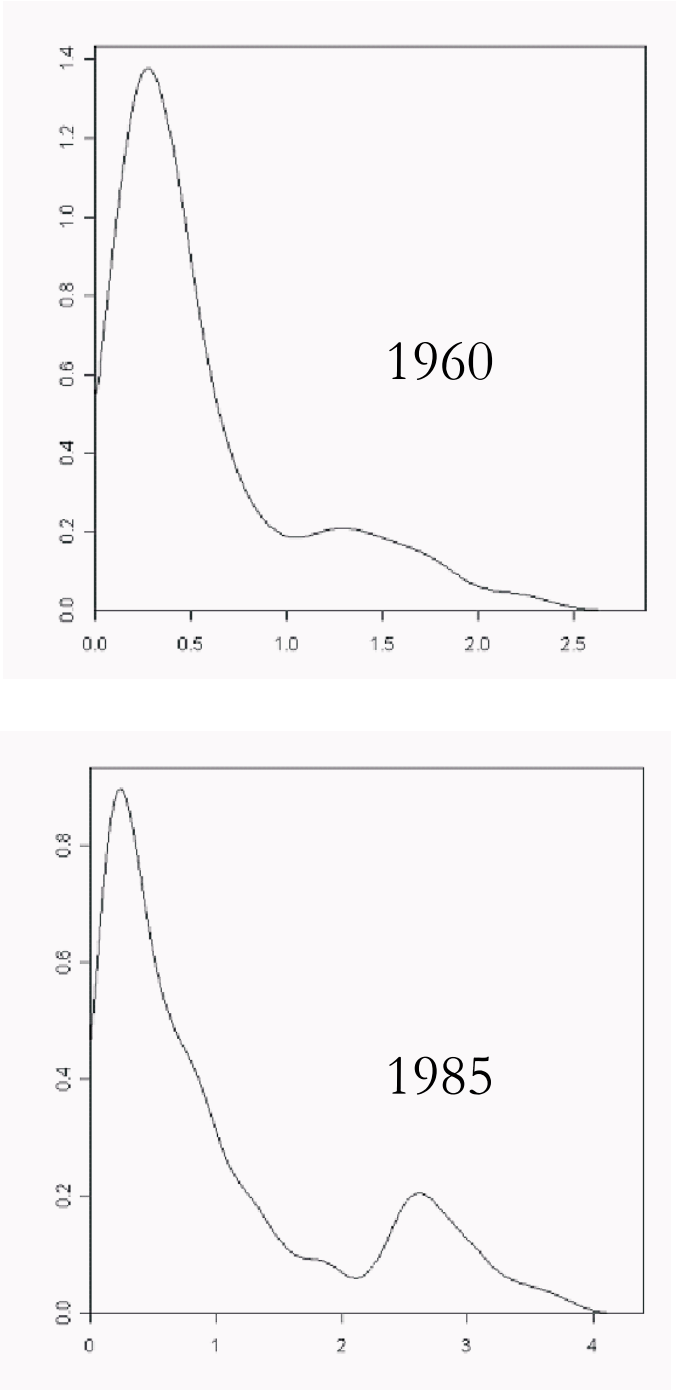


Figure 2.1: Kernel density estimates of relative incomes 1960 and 1985, taken from Semmler and Ofori (2003, pp 23-24).

that the output of individual firms is an increasing function of total employment in this sector. The strength of that externality is denoted by a parameter $\lambda$. The reasoning behind these positive externalities is nested with agglomeration effects known from trade theory. Moreover, individual firms are considered too small to take the externality into account. Capital and labour are assumed to be mobile across sectors, therefore equilibrium conditions require that rental rates in agriculture and non-agriculture are equalised, and that wages are the same. However, the model allows for a sustained wage differential between non-agricultural and agricultural wages, for instance in order to reflect the disutility from urban life or the absence of informal insurances of traditional communities. Hence, wages in non-agriculture equal wages in agriculture plus the wage differential (Graham and Temple, 2001, pp 4-8).

The externality in the non-agriculture sector drives the multiplicity property in the model because the equilibrium conditions are usually fulfilled with two interior equilibria for the labour-share in non-agriculture. The equilibrium with a low labour share in non-agriculture has a smaller output than the equilibrium, with a high labour share because the latter exploits the externalities. In contrast to other models with development traps (including the one introduced in chapter 6), the allocation of labour between sectors is decisive for the choice of equilibrium and the concomitant output-level; there is no endogenous capital accumulation which would be associated with a shift from low to high-income equilibrium.

Local stability of both equilibria requires additional assumptions because the low-income equilibrium (low share of labour in non-agriculture) would usually be regarded as unstable, since small variations in the labour share would trigger divergent adjustments; either to the high-income equilibrium or an exterior equilibrium with a zero labour share in non-agriculture. Moreover, if rental rates are equalised, the capital stock in each sector will be determined by the labour shares and the values of a number of fixed constants, including the externality parameter $\lambda$. Hence, the capital stock can be expressed as a function of labour shares, which means that wages can be written as a function of labour shares. The two equilibrium conditions may be reduced to a single equilibrium condition (Graham and Temple, 2001, p 9).

Messrs Graham and Temple proceed by calibrating the model. They assume that all countries are in either equilibrium—ie, that observed employment and output shares represent possible equilibrium allocations. With this assumption, the single equilibrium condition depends only on employment shares, agricultural output, and some technology parameters. This

data, barring the externality parameter, is relatively easy to observe and avoids recurrence to hard-to-measure data, such as capital stock or sectoral productivity levels. Using a parameter restriction, which is satisfied by most countries in the sample, it is possible to identify a country-specific threshold in the employment share of agriculture. A labour share below this threshold indicates a high-income equilibrium for the country. This threshold decreases in the parameter $\lambda$, so the stronger the externality, the fewer countries will be in the high-income equilibrium. Knowing in which equilibrium a country is located allows to calculate the alternative equilibrium, and to compare the different output levels.

Depending on the value assigned to the externality parameter $\lambda$, Messrs Graham and Temple are able to assign between 18 and 60 percent of observed differences in incomes per worker to multiple equilibria. Moreover, they find that poverty traps are most likely to be found with the poorest countries, and a switch from low-income to high-income equilibrium is associated with an increase in output per worker by factor 1.5 to 2.7 (Graham and Temple, 2001, pp 17-21).

Applying this framework to two different points in time, 1960 and 1988, they look whether countries switched between equilibria or stayed in the same group. The results are sensitive to the chosen externality parameter. For $\lambda = 0.10$, countries such as Botswana and Cote d'Ivoire in Africa, Honduras in Latin America, and Turkey in Europe switched from a low to a high-income equilibrium. Countries such as Ethiopia, Congo (Zaire), or Bangladesh stayed in the low-income equilibrium, while Singapore, Hong Kong, Japan, Germany et cetera remained in the high-income equilibrium. Though there is some mobility from low to high equilibria, no country in the sample experienced a downgrade from a high to a low equilibrium (Graham and Temple, 2001, pp 25-28).

The analysis is not without problems; in particular the strong sensitivity towards the externality parameter renders the results somewhat arbitrary. Furthermore, low-income and high-income equilibria are driven by the allocation of labour to the agricultural and non-agricultural sector, while physical or human capital formation is largely ignored. This potentially downplays the magnitude of differences among equilibria (here given at factors between 1.5 to 2.7) because countries in the rich equilibrium may also be considered more successful at attracting investments and educating the workforce. In fact, there is no explanation why countries are in a particular equilibrium, or what might trigger a shift from a low output to a high output equilibrium—it never happened the other way round. Finally, Messrs Graham and Temple force each country by definition into equilibrium. At the

same time they find that countries have switched equilibria between 1960 and 1988. Such a switch will not happen overnight, therefore one would expect at least some countries being in transition from one to the other equilibrium.

Despite these caveats, the exercise has some virtue, if only to show that even such a stylised model with multiple equilibria can explain a substantial part of international inequality in output per worker. Hence, it may be worthwhile to look for theories which allow for poverty or development traps in order to explain the observed twin-peaks pattern.