

Social Capabilities and Economic Development

Abstract

Development is different from economic growth. Standard growth measures are deficient for evaluating and measuring development because they reflect approaches of an overly individualistic nature. These approaches preclude consideration of a broad range of factors which impinge upon the expansion of a nation's economic capacity such as income distribution and, most significantly, the positive externalities incumbent upon improvements in the stock of human assets from education; the latter improvements are likely to manifest themselves in ordinary growth statistics with a considerable lag. The capabilities approach of Amartya Sen, designed to focus on well-being, also offers a conceptual framework for consideration of the expansion of a nation's economic capacity – here identified with development - which moves beyond the individualistic perspective of standard economic theory and its associated growth measures. Historical and statistical evidence indicates that factors conducive to the enhancement of well-being in a capabilities context also promote long term development.

J.E.L. classifications; I20, I31, O15, O19.

Key words: capabilities, economic development; economic growth; education; human capital

Thanks to Vince Daly, Subrata Ghatak, Francis Green, Truc Nguyen, Peter Skott and Willy Spanjers.

Paul Auerbach
Reader in Economics
Kingston University
Penryhn Road
Kingston Upon Thames
Surrey KT1 2EE

P.Auerbach@Kingston.AC.UK

Preliminary: Please do not cite without permission.

INTRODUCTION

Development is different from economic growth. The simple, and simplistic, identification between these two concepts often found in earlier development literature is less likely to be found at present (Hosseini, 2003: 93; Auerbach 2005). But what then is development, if it is not growth in GDP per capita? Perhaps the most powerful and convincing contemporary conceptualisation is the 'capabilities' approach of Amartya Sen. Thus 'A person's "capability" refers to the alternative combinations of functionings that are feasible for her to achieve. Capability is thus a kind of freedom: the substantive freedom to achieve alternative functioning combinations...The success of a society is to be evaluated, in this view, primarily by the substantive freedoms that the members of that society enjoy' (Sen 1999: 75, 18).

Sen's approach to development has generated an enormous literature, but has not escaped criticism. Most specifically, it has been suggested that his approach to capabilities is overly individualistic and makes little allowance for culture or social structure, a point recognized by Sen (Jackson 2005). In this and other critiques, however, it is assumed that the economic aspects of development are individualistic (Schuller 2007: 18; OECD 2001) and are, implicitly, well represented by standard economic growth measures. Far too much has been conceded to the standard measure of economic growth. In this paper, Sen's capabilities approach is appropriated as part of a critique of the role of the standard growth measure in the context of economic development. This critique has two aspects: first, growth in GDP has been used inappropriately. It has been put to multifarious purposes, including as a measure of economic development. But the growth rate in GDP per capita serves us poorly as a measure of development and (assuming we wish to construct a unitary measure) should be replaced by an attempt to measure changes in 'economic income'. Secondly, however, a society's economic development cannot be viewed individualistically:

1. There are inseparable aspects of a society's orientation and commitment to education, income distribution and health which have a collective effect on development;

2. Perhaps the most severe deficiency to an individualistic approach to capabilities in an economic context is the presumption that the economic benefits to education accrue almost exclusively to the individuals pursuing this education. Such an approach underestimates the accretion to social capabilities of improved education and ignores the powerful lagged effects of such improvement over extended periods of time.

We proceed as follows. In the section below, we outline the case for an approach to economic development based on the enhancement of 'social capabilities'. We first introduce the concept of economic income and then argue for its inherently social nature. In the third section, we offer historical and statistical support for the above propositions. A conclusion follows. The discussion here will largely concentrate on growth in rich countries; in partial mitigation of an absence of attention to the particularly acute problems of poor nations, I offer Dr Marx's observation: 'The country that is more developed industrially only shows, to the less developed, the image of its own future' (Marx, 1867, p.1).

ECONOMIC GROWTH, CAPABILITIES AND ECONOMIC DEVELOPMENT

Sen contrasts his 'capabilities' approach to development with one rooted in utilitarian, welfarist conceptions linked to standard economic growth measures (Sen 1999: 58-63; 290-297). The problem, however, of the ubiquity of 'economic growth' as a societal maximand is an unavoidable one, and worthy of deconstruction, since a broad range of critics¹ and supporters of 'economic growth' are in agreement in one respect – that economic growth is itself an unproblematic concept². This phrase 'economic growth, however, poses an analogy with a natural function, such as the growth of a tree when, as commonly employed, it is used to indicate the rate of increase in an accounting relationship, namely national income. The latter measure was originally created as a diagnostic tool for calculating total expenditure to aid in the regulation of business cycles. In a confused way, it has acquired other roles – it is, in per capita form, a measure of the level of economic welfare over time and between nations, and is used as a indicator of a nation's economic power or capacity³, i.e. as a key indicator of the level of economic development. Thus for Joseph Stiglitz, '...growth increases supply ... [and] should in theory, make [choices between alternatives] less painful' (Stiglitz, 2005).

This unitary measure of 'growth' (in GDP per capita or minor variants) conflates the difference between what an economy has the ability to produce or achieve – the focus of this paper - with the level of well-being it is achieving⁴. The capabilities approach offers an alternative perspective on human well-being to that found in standard welfare economics and (implicitly) its related growth calculations. Here it is suggested that the capabilities approach may also serve as a corrective to standard methodologies dealing with what an economy has the ability to produce or achieve - the human resource and human capital perspectives on economic development - once the latter have been divested of their individualistic presuppositions: 'The two perspectives cannot but be related since both are concerned with the role of human beings, and in particular the

actual abilities they achieve and acquire...the narrower view of [the] human capital approach fits into the more inclusive perspective of human capability which can cover both direct and indirect consequences of human abilities' (Sen 1997: 1959). In what follows, economic development is identified with the expansion of economic capacity and is linked to Sen's capability framework, with its important departures from the individualistic methodology of standard theory.

Economic Income

Growth in national income ('economic growth') is an imprecise or even inaccurate measure of changes in national economic capabilities, which would be more appropriately conceptualised using the notion of 'economic income'. The literature in this area links income to accretions to net assets: John Hicks's famous definition makes income the maximum amount that an individual can consume in a given time period and still expect to be as well off at the end as at the beginning (see Parker and Harcourt, 1969, especially pp. 3-29). The only explicit or real life manifestation of this conceptualisation is to be found for business firms, where attempts are made, unlike in the case of nations, to keep a record of the change in the value of assets (capital stock), which must then be reconciled with the income statement⁵. The intuitive conceptualisation is straightforward: any firm that thinks it is making substantial income (profit) while 'running its assets (e.g. machinery) into the ground' is living in a fool's paradise – in calculating income, as opposed to mere cash flow, due account must be taken of the depreciation (or indeed appreciation) of assets owned⁶. An appropriate measure of the economic income of a nation would be the flow correspondent to a correct valuation of its stock of assets. By contrast, while the standard national income (e.g. GDP) measure is, in keeping with its primary role as a tool of macroeconomic regulation, a marginally modified cash flow measure and is inappropriate for tracking social capabilities.

Pioneering work on applying the economic income framework in a social context has been done by environmental campaigners, who have used it to criticise

national income measures for making no deductions for the running down of a society's natural resources which are common property (e.g. the atmosphere in the context of global warming) - key elements of its collective 'capital stock'. They argue that if national income measures are to be used as indicators of economic capabilities, national income calculations must be modified to take into consideration the deterioration in the natural environment with, for instance, appropriate deductions for increased pollution of the air and water (see Anderson, 1991; a perspective from economists and others may be found in Arrow, *et al.*, 2004).

A further gap between economic growth and changes in social capabilities may be seen in the problem of irreversibilities: decisions made today restrict choices in the future, so that growth rates emanating from those decisions do not necessarily correspond to greater economic capabilities in the form of enhanced choice. In the context of the natural environment, a central consideration is that many decisions are irreversible, or at least very difficult to reverse, while issues surrounding public transport also illustrate that decisions made in one generation may well exclude alternatives forever. Thus, many European cities are fortunate in the fact that they are too old and too cramped for them to have been completely destroyed to accommodate the car; the intransigence of U.S. political leaders in international discussions concerning energy reduction in the context of global warming is at least partially linked to structural rigidities in the low density, car oriented environment created in the U.S. in the twentieth century. Irreversibilities in cultural development are also possible: societies may also abort the inter-generational transmission of skills and knowledge, so that, for instance, in the process of economic development and urbanisation many folk traditions in music, art and literature may die out.

Human assets

In this paper, the central emphasis is on how an inadequate consideration of the accretion of human assets⁷ can lead to an incorrect calculation of the trajectory

of economic capabilities. Increases in national income poorly represent increases or decreases in the stock of human assets and therefore do not give an accurate notion of the trajectory of a nation's economic capabilities:

1. Much of what appears as 'consumption' by poor people in the national accounts is in fact expenditure to maintain human assets. Income distribution considerations and their relation to education, health and income mobility are thus key components of a nation's economic power or capability and therefore central to an appropriate economic growth calculation.

2. There are significant positive external effects to educational improvement (largely pushed to one side by the 'human capital' literature): many of the benefits to society of improved education will therefore register in conventional national income calculations only with a substantial lag. Lags will also appear because of inter-generational effects and the residual *in situ* advantages of established economic powers (Auerbach, 2007). Thus a key empirical proposition here is that economic development, appropriately conceptualised, manifests itself in conventional growth rate terms with a long (and possibly) variable lag.

3. The above arguments partially account for the 'miraculous' emergence of Japan and South Korea and other nations as great economic powers and suggest why conventional growth rate calculations are a poor guide to future economic development.

If the perspective presented here is valid, it gives the lie to the notion that poverty alleviation and education are 'luxuries' to be afforded when economic growth gives a society the capacity to finance them. Rather, they are key aspects of economic growth, appropriately calculated.

Income distribution

Income distribution and poverty alleviation considerations are directly relevant to the trajectory of an economy's capabilities, but appear nowhere in standard

income accounts because of their underlying conceptual basis: the roots of these accounts in macroeconomic regulation make for a distinction between 'consumption' (purchases of consumer durables and non-durables) and 'investment' (purchase by businesses of plant and equipment). But from a developmental perspective, this distinction is inappropriate. National income accounts in their present form do not incorporate the notion, usually linked with Marx, that the greater part of consumption for the poorer section of a population is for the 'reproduction of its labour power' rather than true consumption^{8,9}.

Thus, existing national income accounting methodology can make no adjustments for the 'accelerated depreciation' of the stock of human assets such as that which took place in Britain during the early phases of the Industrial Revolution, both in physical and in educational terms (on the latter, see Cipolla, 1969, chapter 3; Nicholas, 1990). As a result, periods of intense development in industry and agriculture will overestimate any reasonable calculations of the true growth in a nation's economic income if there is an accompanying deterioration in the stock of human assets^{10,11}. Thus the influence of income distribution on human capital formation is not (as suggested in UNCTAD, 1997, p.68) solely due to its indirect effect, that is upon the ability of individuals to invest in education, but directly as well as a result of its effect on the capabilities of the poorest members of society in such basic parameters as health, food subsistence and housing.

This indirect effect of income distribution on economic development is of major significance, but must be seen in a broader social context (Schuller 2007 20-22). Rapid growth among the Asian 'tigers' was accompanied not only by a distinctive rise in levels of educational attainment but by the maintenance of a limited dispersion between the incomes of the rich and poor during the crucial periods of their respective transitions from poverty to wealth. The low level of income inequality itself promoted the likelihood of rising educational standards¹², as suggested in the UNCTAD study above, by raising the likelihood that poor

families would have the capability of providing the resources that are complementary to educational study. Limited inequality, however, is also critical to promoting social mobility¹³, which has the effect of increasing the incentives for the poor to raise their levels of educational attainment and raises the efficiency with which society uses its human assets.

Human assets and educational externalities

Present day discussions of accretions to human assets ignore the broader range of considerations dealt with above and deal exclusively with educational attainment. But even in this restricted context, the social ramifications of education are not adequately dealt with. In a survey of the literature on formal education and economic development Sianesi and Van Reenen, 2003 make a distinction between a labour economics literature showing substantial monetary returns to investment in education by individuals (linked to the 'human capital' literature of Becker, 1994), and a macroeconomic literature which attempts to measure the returns to society as a whole of investment in education, including any external or 'spillover' effects, which are presumed to be largely of a positive kind. In their review focusing on the macroeconomic literature, Sianesi and Van Reenen conclude that there is indubitably an independent effect emanating from education, the main issue being whether this effect is manifest on the level or the rate of growth of national income. The latter distinction, they concede, makes little difference in most practical applications.

The theoretical essence of the human capital literature can be summed up simply (Becker, 1994): increases in educational attainment can be treated as an investment which individuals undertake. The costs are the explicit funds put forth to pay for education, and the opportunity cost of the income foregone by undergoing the educational process. The benefits for the individual can be measured by the future stream of enhanced earnings incumbent on the investment; the gross social returns may be calculated simply by aggregating the enhanced earning streams of individuals.

The literature dealing with education and economic development from a macroeconomic perspective takes its guidance from the human capital literature, so that the issue of positive externalities to education is treated as a peripheral matter. Thus, in two major surveys of the literature, Sianesi and Van Reenen, 2003 and in Temple, 2001 the discussion of 'spillovers' is perfunctory. Such a limited commitment, however, fits awkwardly with the latter's assertion that the presence of difficulties in fully capturing the benefits of research and development (i.e. that there are spill-over effects to the augmentation of human knowledge) is 'uncontroversial' (pp.60-2; 93). Other studies, if broad-based, put the issue to one side (Blundell, *et al.* 2001) or approach the question from a limited perspective (Moretti, 1998). Exceptions to the failure to highlight social role of education in economic development are rare (Sen 1999 128-129 and Lucas 1988, to be considered below).

But the role of positive externalities to education in economic development is far too weighty to put to one side. The human capital literature is suggesting, as a first approximation at least, that there are no positive external benefits to the education of a society's population¹⁴, an approach sharply in contrast both with the one taken here and that is implicit in the literature on the 'new' economic growth, where the external or spillover effects of newly acquired knowledge play a crucial role (as suggested by Temple above) in economic growth and development (Skott and Auerbach 1995). There would seem to be two implicit, but related justifications to support this avoidance of the externalities question. First, at an empirical level, this presumption greatly simplifies the problems of estimating the effects on society of enhanced education: its effects can be observed simply by measuring the rises in income consequent on education through the employment career of individuals; secondly, at a conceptual level, the measurement of the social effects of education is simplified to an aggregation of its effects on individuals. In such a context, movements in national income might track, with reasonable accuracy, the effects of accretions in human assets

to movements in economic income in the same way that other investments in the economy, e.g. the purchase by a firm of a lathe, are, it is presumed, correctly reflected.

Contrarily, it is suggested here that, in the presence of positive external effects to enhanced education:

1. the effects of enhanced education on economic income are substantially underestimated by seeing its effects solely on the trajectory of the incomes of individuals;
2. the effects of the timing and diffusion of enhanced education through society are likely to be far more complex than postulated in the standard approach, with lags and possibly a far longer term trajectory for the effects of education.

Some attempt to enumerate the external effects likely to emerge from educational improvement is imperative, not only to give plausibility to the macroeconomic results which verify empirically the presence of such effects in a general way, but to highlight the reasons why, as is suggested below, the effects of educational improvement are likely to be manifest only with a long lags. Plausible examples of external effects are as follows:¹⁵

1. Improvements in communication skills. Improvements in individuals' communication skills (e.g. language literacy), when manifested outside the sphere of employment, yield unremunerated gains to society as a whole. Such improvements are analogous to the positive externalities inherent in purchasing a telephone in 1930: the value of everybody else's telephone is increased. The more literate and more numerate the consumer, the more articulate they are, presumably, in communicating, in verbal and written form, their wants to producers. An enhancement of communication skills thus lowers the 'costs of search' on the part of consumers, which promotes market efficiency.

Improvements in knowledge by consumers in particular areas can enhance the monitoring of product quality.¹⁶

2. Emulation. Much new learning is communicated by imitating a master of an art (de Waal, 2001), and these 'lessons' may take place even when they are involuntary on the part of the master. Noam Chomsky points out that language acquisition takes place on the part of children even in societies in which communication with adults is discouraged or forbidden. Leading economies are likely to possess a disproportionately large number of firms and individuals worthy of emulation who can be observed at first hand.

3. Spill-over effects from accretions to knowledge which are general or which have 'fuzzy' boundaries. The more basic and fundamental ('general') are any accretions to knowledge, the more difficult it is for the individual to capture the full value of that knowledge (e.g. Newton's laws or Maxwell's equations). In a more modest context, improvements in knowledge and skill in one sector of economic activity may yield positive benefits in another when the boundaries between these activities are unclear: it proved difficult for Xerox to appropriate the full value of their innovations in software (much of which was harvested by Apple and Microsoft), perhaps because their perspective was delimited to the domain of office copiers. This phenomenon may help to account for the continued presence of industrial 'clusters' (e.g. 'Silicon Valley'), in which closely related and complementary products are produced within a restricted region.¹⁷ Technological spillovers of this kind have been singularly emphasised in discussions of education and economic growth due, undoubtedly to the role they play in the 'new economic growth' literature. As, over time, the ratio of science to craft-based knowledge rises, the rate of diffusion of new ideas will tend to accelerate, since scientific, as opposed to craft-based ideas are inherently more replicable and less embodied in the skills of individuals (Auerbach, 1988, ch. 9); the larger the cohort of individuals capable of monitoring these increments to knowledge, the greater the possibility of spill-over effects (Nelson and Wright, 1992). Appropriate levels of education are thus crucial not only for the development of

new ideas, but for the assimilation and appropriation of already existing knowledge, a role perhaps of especial importance for developing countries.

4. Raising society's 'productivity' as a parent. The exceptional efforts made in Japan from the late nineteenth century to educate the whole of their population, including women, was based on the presumption of the spill-over effects attendant on the upbringing of children by educated mothers¹⁸. In the context of inter-generational transfers of knowledge Lucas, 1988, p.39 suggests that '...human capital accumulation is a *social* activity, involving *groups* of people in a way that has no counterpart in the accumulation of physical capital' (emphasis in original).

5. Inherently interactive effects. A grand catch-all category: there are a range of human activities outside the sphere of employment in which improvements in the skills of individuals will have positive spill-over effects in society due to their inherently interactive nature. For instance, improvements in one's skill in driving a car will generate social benefits beyond those which accrue to the individual doing the driving.

Lags in the growth process will be present simply because of the time needed for inter-generational effects to manifest themselves (Lucas, 1988, p.19). Not recognised in the growth literature, however, is the likelihood that the spillovers from education will be dispersed with a lag through a 'multiplier' effect (e.g. the process of emulation of those individuals with newly acquired skills will take time). Furthermore, the aforementioned 'clustering' effects of improvements in education may involve delays, as complementary aspects of the development process, such as an enhancement in the levels of health and nutrition, may be required; concomitant development of physical infrastructure (most obvious in the case of libraries and scientific equipment) may be necessary, and these physical improvements may have to reach a level of 'critical mass' before we can observe concrete changes in people's lives. In the obverse direction, fears have recently been expressed that the decline in the US manufacturing base could result in a loss of the minimal capacity necessary to engender the traditionally productive

interaction between skills in the manufacturing sector and those linked to research and development (PCAST, 2004).

TRAJECTORIES OF ECONOMIC DEVELOPMENT

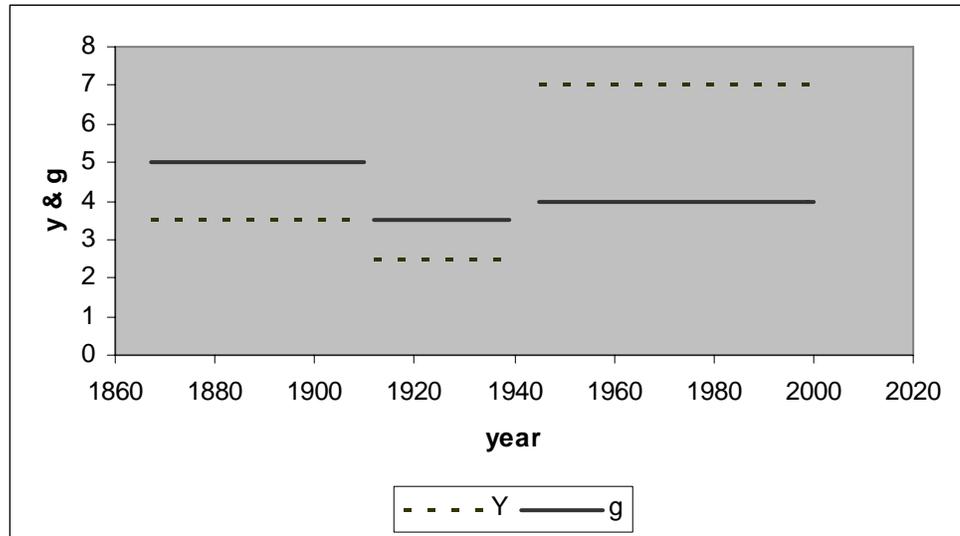
What emerges from the discussion of economic income and the discussion of externalities in human asset accretion is a perspective on the trajectory (and implicitly the causes) of economic growth. Figure 1 below uses this perspective to offer a view on Japanese economic development that is at variance with one emerging from standard economic growth measures. Thus the figures for **y** show Japan manifesting very respectable rates of improvement for the periods before and after the First World War, but the truly remarkable results are those for the post Second World War period. By contrast if we examine the path of economic income or **g**, the truly 'heroic' process of growth in economic income took place in the period subsequent to the Meiji Restoration of 1867. The most important component of this growth was the accretion to human assets attendant upon the massive programme of education undertaken (Hanley, 1990): post war growth then emerges less as a miracle than as a realisation of past accretions of economic potential.

The trajectory of economic income is thus quite different from one emerging from conventional measures¹⁹. In Figure 1, we see that:

1. Overall growth rates are smoother across time periods for economic income than for conventional measures;
2. rapid growth in economic income associated with accretions to human assets is likely to manifest themselves in conventional growth rates only with long lags.

Figure 1

Japan: Growth History



- y = growth rate in national income
- g = growth rate in economic income

Sources: y – estimates taken from Maddison, 2001, Table A-j, p.206.

g – illustrative conjectured estimates

Historical and statistical studies

For some authorities, the education – economic growth story is so decisive as to cause one historian to ask ‘Why isn’t the whole world developed?’ (Easterlin 1991). No other single factor works so well in the modern world at explaining economic success – China appears as a striking rebuke even to the old conservative standbys of the need for strict property rights and a government with minimal levels of corruption. But, as we have seen above, while current statistical studies confirm a cause-effect relationship between education and economic growth (and reject the notion that education may be thought of as a luxury consumed in greater quantities as a society grows richer), this result has only been accepted among economists after long controversy.

Why has the present consensus on the role of education as a key aspect of economic growth taken so long to emerge? In essence, the relationship

sometimes appears indecisive in empirical terms for several reasons. First, many of the most powerful effects of education are likely to register with a substantial lag, for the reasons noted above. Secondly, it is possible that it is only in the post Second World War period that the education – economic growth relationship has registered to full effect, for reasons suggested by the nineteenth century British observer, Leon Playfair: 'Raw material, formerly our capital advantage over other nations, is gradually being equalised in price, and made available to all by improvements in locomotion. Industry must in the future be supported, not by a competition of local advantages, but by a competition of intellects' (quoted in Mathias, 1979, p.50).

But Playfair's astonishing prescience may well have been premature. There was an apparently insignificant influence of broad-based education in the early industrial revolution in Britain (see Mitch, 1990), a period as we have seen, in which educational standards may have deteriorated; the central roles played by the US and Germany in the late nineteenth century 'second industrial revolution' may well have had as support their exceptional commitment to public education (Lindert, 2004, chs 5 and 6; Goldin and Katz 2001), but the case is somewhat blurred by the fact that both of these countries, especially the former, were extremely well endowed with the natural resources relevant to economic growth in this period. It is only in the latter part of the twentieth century that we see the emergence of the Netherlands and especially Sweden²⁰ as rich countries after long apparent stagnation. Their examples, the even more striking emergence of resource-poor Japan and South Korea, and the 'miraculous' economic resurgence of post war (West) Germany in the context of massive destruction of the physical²¹ and human capital (i.e. five million young men) appears to be striking confirmation of Playfair's assertion of the centrality of 'intellect' and social capabilities. It is difficult not to associate what appears to be an enhanced disengagement between natural resource endowment and economic development with post Second World War globalisation tendencies (Frieden, 2006, ch 18)

A third reason why it has proved more difficult to give statistical support to the notion of a deep foundational role for education in economic development is that educational improvement may only be a component in a complex historical process and must be seen alongside the complementary developments that enhance human capabilities discussed above.. Thus, in Figure 1 above, human asset accumulation will have significant effects on the trajectory of economic growth, but only with long lags. One statistical study shows only a weak association between literacy and income for 20 European countries in 1850, but a much higher one between literacy in 1850 and income in 1970 (Sandberg,1982; Easterlin, 1991).

Data limitations pose a major obstacle in any attempt to search for the lagged effects on economic growth in the context of the broader range of considerations surrounding social capabilities. The Human Development Index (HDI) of the UN will be used here as a surrogate for economic income and social capabilities. Sen 1991 quite rightly objects to reducing the capabilities approach to a single metric (note 41, 318-319), but does not wholly disassociate himself from an identification between the HDI and capabilities (79). One virtue of the HDI data set is that it has been in existence long enough to test, for a broad selection of nations, the proposition of a lagged link between accretions to social capabilities and conventional economic growth over one generation (about 25 years): this period is far less than the lag implied in Figure 1 or in Easterlin's study, but is perhaps long enough, in the contemporary period, to be convincing.

The HDI is a measure which is simultaneously efficacious at capturing important aspects of the capabilities approach in comparison with a standard GDP per capita measure as well as having elements of conceptual inconsistency²². Thus, the HDI is an amalgam of three 'dimensions' – GDP per capita, life expectancy at birth, and education. The GDP dimension of the HDI embodies an income distribution aspect by constraining the influence of very high levels of GDP on the index (GDP is calculated in logarithmic form and a cap is imposed

upon maximum GDP)^{23,24}. Life expectancy at birth is an amalgam of two conceptually different statistics of interest. First, among poor countries, it will be importantly affected by the level of infant mortality. Secondly, it also reflects the extent to which members of the population have the opportunity to live 'long and healthy lives' – a conceptually different issue. The education dimension is also an amalgam of two different conceptualisations. The adult literacy component is a measure of a society's accomplishment in achieving the goal of literacy, its output of the desired result. The gross enrolment in schooling ratio, by contrast, is an indication of the level of input devoted to achieving the desired result.

In a causality testing framework, HDI rankings can be seen as 'causing' GDP rankings if their lagged values improve the explanation of current GDP rankings relative to what can be achieved by GDP rankings alone. Finding such a causal linkage running from HDI rankings to GDP rankings may thus be seen as evidence that a country's state of economic development is not fully accounted for by per capita GDP.²⁵ Those nations in 1975 which show a disproportionate 'orientation' in the direction of human asset accumulation for a given income level will, it is predicted, have a relatively favourable economic growth outcome a generation later. The following simple least squares regression²⁶ is estimated for the: large group (85) of nations available for the statistical test.

$$R_y (2000) - R_y (1975) = a + b [RHDI (1975) - R_y (1975)],$$

where

R_y = a county's RANK according to its per capita GDP

$RHDI$ = a county's RANK according to the HDI

Table 1:

Dependent Variable: GDP rank improvement
Included observations: 85

Variable	Coefficient	t-Statistic	Prob.
Constant	0.040	0.052	0.9584
Initial HDI rank advantage	0.571	6.350	0.0000

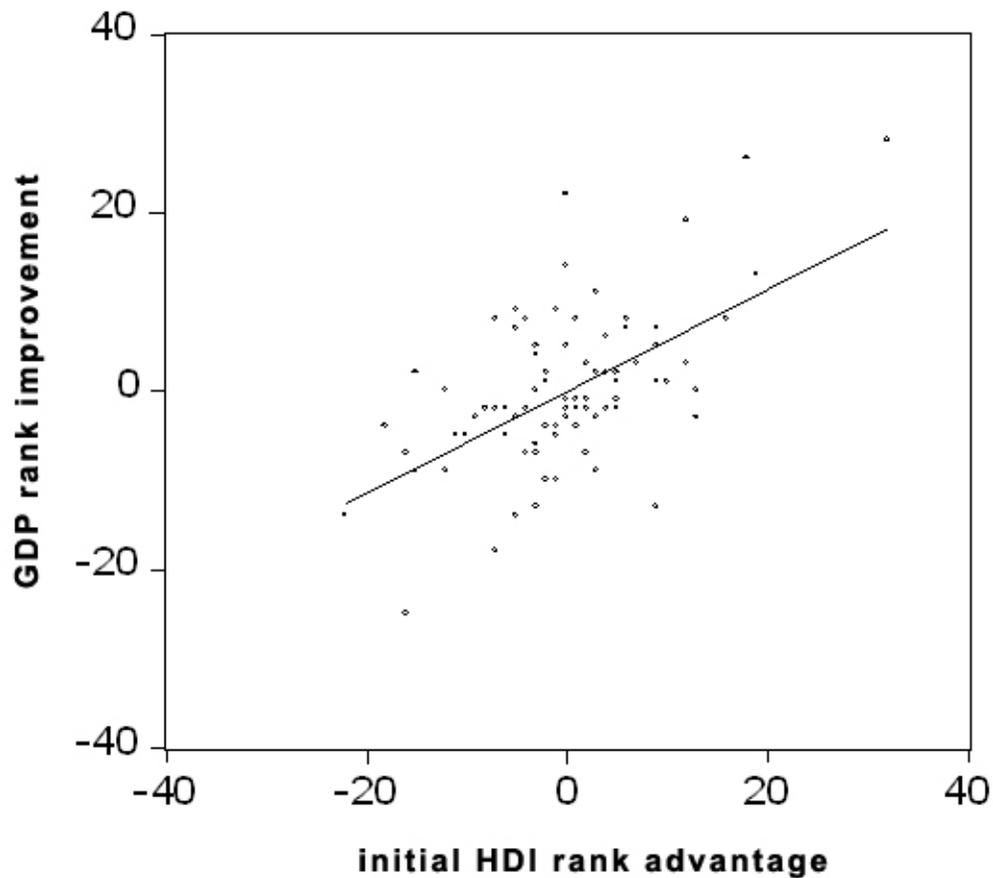
R-squared: 0.327

Sources: UNDP (2005). Human Development Reports - http://hdr.undp.org/statistics/data/excel/hdr05_table_2.xls

Penn World Table version 6.2 (1950-2003) - <http://pwt.econ.upenn.edu>

Note: a minus sign indicates that drop in ranking of a country

Figure 2: HDI Orientation and Lagged GDP Rank Improvement



While in no sense pretending to be a complete empirical modelling of the relationships described above, these results (Table 1 and Figure 2) offer suggestive confirmation of a lagged link between an earlier focus on human

asset accumulation and expansion of capabilities by a nation and its subsequent success in conventional growth terms.

Problems and contradictory cases

There are many good reasons to be suspicious of the thesis brought forth here. One is a perfectly good *ad hominem* critique: a teacher in a university can hardly claim to be disinterested when postulating a pervasive presence of positive external effects for education. There are many other issues, however, some of which relate to the thesis itself, and others which are linked to its empirical representation.

1. The dark side of education. There have, of course, always been critics of the need for generalised education, or even literacy: the poor would learn to despise their lot in life, leading to a servant problem or even incendiary and revolutionary sentiments on the part of the rabble. Perhaps more contemporaneously relevant is the concern of a king's counsel in eighteenth century France (presumably a follower of Turgot) worried about the over-production of priests and lawyers – unproductive labourers (Cipolla, 1969, p.65). At other times, there have been claims of an 'over-production' of various sorts – of Italian engineers in the early twentieth century (Guagnini, 1993) and university graduates in general in late twentieth century US (Freeman, 1976). I address below some of the conceptual issues surrounding this notion of 'overproduction'. The current fashion for an emphasis on practical, applied and 'relevant' education merely exacerbates the putty-clay aspects of irreversibility in the accretion of knowledge by individuals and is likely to make them less flexible in response to changing economic and social conditions.

2. Measurement issues. There are major problems in the measurement even of illiteracy²⁷ (Cipolla, chapter 1); *a fortiori* the difficulties in calculating accretions to human assets are enormous (Wößmann, 2003). Conceptually, the most fundamental distinction is between measures of 'input' (e.g. years of schooling) and 'output' (most commonly accretions to individual incomes).

3. Long term cultural knowledge. As suggested in note 14 above, the enhanced ability of French and Italian consumers to monitor food quality compared with other groups in Europe (e.g. the British) raises the problem of knowledge not due explicitly to education, but linked rather to some notion of 'tradition'. Troublesome in this context is the apparent fact that states which were on the front ranks of school education in the late nineteenth century (e.g. Prussia, Sweden, the US) had earlier been pioneers in eliminating illiteracy. In this context, the focus in this paper must be linked to the empirical, Popperian assertion that the differences in human asset stocks between societies can be largely explained in terms of visible, concrete policy actions taken in these societies at various historical moments and not to 'age old' distinctions between societies linked to 'culture' or racial differences.

4. Expectations: potential and actualised wealth. One of the problems posed in Part I surrounding the notion of 'economic income' is whether $K_2 - K_1$ (the difference in the value of assets at the beginning and the end of the period) is to be approached from the perspective of expectations, as opposed to the 'actual' values of $K_2 - K_1$. The controversy concerning this distinction in the 1930s was undoubtedly focused on the problems of macroeconomic realisation. Here, however, I choose to deal with the question of the valuation of assets from a problem which emerged in, perhaps, a particularly acute form in the context of the former Soviet economy – what value is one to place on a tonne of steel which is used to make a tractor, which is then shipped to a collective or state farm, which then remains idle and serves no part in the production of grain?²⁸

It is precisely this problem which is passed over in standard approaches. In orthodox growth theory, old and new, growth is explained by the effect of factors – unskilled labour, human capital, capital equipment – with the implicit presumption that these factors are being used efficiently. This approach implies that a whole set of problems surrounding how best to organise resources is assumed away. It is implicitly presumed that the competitive process – 'the

market' – has solved these problems by weeding out inefficient practices and producers. But countries may perform less well than others simply because their economies use given inputs with less efficiency than in other countries.²⁹ A model which does not go beyond the presumption of full efficiency cannot even address this possibility. By construction, it must be blind to those organisational and institutional factors that could influence the degree of productive efficiency.

Consider the case of a developing country which seems to get low 'returns' in terms of economic growth on its investment in education. A critical question, most especially if we are to generalise this experience to other countries at comparable levels of development, is as follows: is this failure an *intrinsic* aspect (i.e. in terms of the nation's 'production function') of the inability of a country at this level of development to absorb or make use of educated individuals, or are these individuals being used inefficiently because of corruption, race or caste discrimination? If the low productivity in a country is rooted in such factors, it may not be useful to generalise this experience as a 'law', widely applicable to other countries.

We have the obverse problem in dealing with the spectacular successes achieved in economic growth in a set of newly industrialising 'countries' (Hong Kong, Singapore South Korea and Taiwan) from 1966 to 1991 in the context of a famous study of this phenomenon. Thus, Young (1995) accounts statistically for these levels of growth by rises in participation rates (most especially by women), investment to GDP ratios, improving levels of education and inter-sectoral transfers of labour from agriculture to, largely, manufacturing. Once these factors are accounted for, there is nothing exceptional in the performance of these economies in terms of the growth rates in productivity, either in the whole economy or in manufacturing. Neoclassical growth theory, he claims, can well explain most of the difference between the performance of these and other post war economies (p. 675).

Has anything of interest really been explained here? We are told that improving educational attainment in these economies contributed one per cent per annum additional growth in labour input in each of these economies. But especially in the larger economies of Taiwan and South Korea, we have witnessed a gigantic social transformation of the population – from rural to urban and from agriculture to manufacturing. Can we simply take for granted that the economy and society would successfully absorb and re-allocate this enormous movement of people successfully? Could the rise in worker participation and the efficacious transfer of people have taken place without the major ‘investment in human assets’ represented by public policies promoting income redistribution and, especially, the substantial investment in schooling?³⁰

The question remains whether the contribution of the broad commitment to education in these countries can be calculated, as Young does, in terms of its separable contribution, or whether it had ‘spillover’ effects facilitating the increased participation of, especially, women and the general mobility and flexibility of labour, including the inter-sectoral transfers of labour from agriculture to manufacturing. Public policy acts promoting the growth of human assets may well have permitted these economies to operate closer to the ‘frontier’ of their possibilities and were thus necessary prerequisites of the exceptional growth rates attained. The theoretical and statistical presumption (implicit in Young’s estimation technique) that we are always on the frontier of a production function³¹ possibly obscures, rather than enlightens, one of the most remarkable social and economic transformations of modern times.

CONCLUSIONS

There is some affinity between the approach taken here and that to be found in models of the ‘new’ economic growth theory, especially Lucas (1988), with its emphasis on the positive external effects to human capital accumulation. Indeed, Lucas has suggested, as part of a critique of standard neo-classical theory that ‘By assigning so great a role to “technology” as a source of growth,

the theory is obliged to assign correspondingly minor roles to everything else, and so has little ability to account for the wide diversity in growth rates we observe' (p.15).³² For Lucas (pp.35-39), cities are conurbations embodying exceptionally high levels of such human externalities: the differential rents attached to living in those cities can potentially be used as measures of the value of these externalities. But a one-sided search for external effects to human asset accumulation in city rents might be appropriate for a study of ancient Mesopotamia, but seems irrelevant to the contemporary period. If, as postulated here, these external effects are pervasive in society, measurement of these effects will remain elusive in the modern age, being widely cast in spatial terms and clustered in unlikely places.

The existing literature has concluded that accretions to human capital in the form of education can be linked to rises in the incomes of individuals and therefore to 'economic growth'. But recognizing the broader forms and social context of such accretions causes us to re-examine both the likely magnitude and timing of these accretions. The magnitude of the social impact of education and other forms of augmentation to human capabilities is greater, and more decisive than would be posited in a purely individualistic approach; much of this impact is likely to register only with a substantial lag using conventional growth measures. While the arguments and empirical evidence presented here are congruent with the historical record of many countries throughout the twentieth century, the interactive complexity and socially embedded nature of the factors involved implies that a truly coherent picture of their relation to the process of development will emerge only with difficulty.

REFERENCES

- Aghion, P., Caroli, E, Garcia-Penalosa, C. (1999) 'Inequality and Economic Growth: the Perspective of the New Growth Theories' *Journal of Economic Literature* 37(4), Dec.: 1615-1660.
- Amsden, A. (1992) *Asia's Next Giant: South Korea and Late Industrialization* Oxford: Oxford University Press.
- Anand, S. and Sen, A. (2003) 'Human Development Index: Methodology and Measurement' in Fukuda-Parr and Shiva Kumar (2003):138-151.
- Anderson, V. (1991) *Alternative Economic Indicators* London: Routledge.
- Armstrong, P., Glyn, A. and Harrison, J. (1991) *Capitalism Since 1945* Oxford: Blackwell.
- Arrow, K, Dasgupta, P., Goulder, L. Daily, G., Erlich, P., Heal, G. Levin, S., Mäler, K., Schneider, S., Starret, D., Walker, B. (2004) 'Are We Consuming Too Much?' *Journal of Economic Perspectives* 18(3) Summer: 147-172.
- Auerbach, P. (1988) *Competition* Oxford: Basil Blackwell.
- Auerbach, P. (2005) 'Economic Development, Technological Change, and Growth' *Encyclopedia of Social Measurement* 1 Elsevier: 733-740.
- Auerbach, Paul (2007) 'U.S. Decline in the Context of Formal Education and *In Situ Learning*' *Journal of Economic Issues* September: 715-728.
- Auerbach, P. and Skott, P. (1995) 'Michael Porter's Inquiry into the Nature and Causes of the Wealth of Nations – A Challenge to Neoclassical Economics' in Groenewegen, J., Pitelis, C. Sjöstrand, S-E. (eds) *On Economic Institutions Theory and Applications* Aldershot: Edward Elgar.
- Becker, G. (1994) *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* Chicago: University of Chicago Press; original publication: 1964.
- Blundell, R. Dearden, L. and Sianesi, B. (2001) 'Estimating the Returns to Education: Models, Methods and Results'. Paper presented at the RS Social Statistics Section, 27th February.
- Björklund, A. and Jäntti, M. 1997 Intergenerational Income Mobility in Sweden Compared to the United States *American Economic Review* 87 (5) December: 1009-1018.

- Cipolla, C. (1969) *Literacy and Development in the West* Harmondsworth: Pelican.
- Daly, V. (2006) 'Exploring the Dynamics of International Rankings' *Kingston University Seminar Series* 8 November.
- Dasgupta, P. (1993) *An Inquiry into Poverty and Destitution* Oxford: Clarendon Press.
- Delbanco, A. 2007 Scandals of Higher Education *New York Review of Books* LIV (5) 29 March:42-47.
- de Waal, F. (2001) *The Ape and the Sushi Master* N.Y.: Basic Books.
- Easterlin, R. 1981. Why isn't the whole world developed? *Journal of Economic History*, XLI, no. 1, March.
- Fox, R. and Guagnini, A. (eds) (1993) *Education, Technology and Industrial Performance in Europe, 1850-1939* Cambridge: Cambridge University Press.
- Freeman, R. (1976) *The Overeducated American* New York: Academic Press.
- Frieden, J. (2006) *Global Capitalism Its Fall and Rise in the Twentieth Century* New York: Norton.
- Fukuda-Parr, S and Shiva Kumar, A.K. (2003) *Readings in Human Development* Oxford: Oxford University Press.
- Galor, O. and Moav, O. (2004) 'From Physical to Human Capital Accumulation: Inequality and the Process of Development' *Review of Economic Studies* 71:1001-1026.
- Goldin, C. and Katz, L. (2001) 'The Legacy of U.S. Educational Leadership: Notes on Distribution and Economic Growth in the 20th Century' *American Economic Review* 91(2) May:18-23.
- Guagnini, A. (1993) 'Academic Qualifications and Professional Functions in the Development of Italian Engineering Schools, 1859 -1914' in Fox and Guagnini (eds) (1993), pp. 171-195.
- Hanley, S. (1990) 'The Relationship of Education and Economic Growth: the Case of Japan', in Tortella (ed.) (1990), pp. 69-87.
- Hicks, J. (1940) 'The Valuation of Social Income' *Economica* 7(26) May: 105-124.

Hosseini, H. 2003 'Why Development is More Complex than Growth: Clarifying Some Conclusions' *Review of Social Economy* LXI (1) March: 91-110.

IMF (International Monetary Fund) (2006) *Finance & Development*, 43(1), March.

Jackson, W. (2005) 'Capabilities, Culture and Social Structure' *Review of Social Economy* LXIII (1) March: 101-123.

Kuznets, S. (1955) 'Economic Growth and Income Inequality' *American Economic Review* 45,1 (March), 1-28.

Lindert, P. (2004) *Growing Public: Social Spending and Economic Growth Since the Eighteenth Century* Volume I Cambridge: Cambridge University Press.

Lundberg, M. and Squire, L. (2003) 'The Simultaneous Evolution of Growth and Inequality' *Economic Journal* 113 (April): 326-344.

Lucas, R. (1988) 'On the Mechanisms of Economic Development' *Journal of Monetary Economics* 22: 3-42.

Maddison, A. (2001) *The World Economy* Paris: OECD.

Mathias, P. (1979) *The Transformation of England* London: Methuen.

Marx, K. (1867) *Capital* Volume 1 Preface to the first German edition, as cited in [marxists.org/archive/marx/works/1867-c1/p1.htm].

Mathias, P. (1979) *The Transformation of England* London: Methuen.

Mazumdar, K. (2003) 'A New Approach to the Human Development Index' *Review of Social Economy* LXI (4) December: 535-549.

Mitch, D. (1990) 'Education and Economic Growth: Another Axiom of Indispensibility? From Human Capital to Human Capabilities', in Tortella (ed.) (1990): 29-45.

Moretti, E. (1998) 'Social Returns to Education and Human Capital Externalities: Evidence from Cities' Centre for Labour Economics UC Berkley Working Paper.

Nelson, R. and Wright, G. (1992) 'The Rise and Fall of American Technological Leadership: the Postwar era in Historical Perspective' *Journal of Economic Literature* XXX (December):1931-1964.

Nicholas, S. 'Literacy and the Industrial Revolution' in Tortella (ed.) (1990), pp. 47-68.

Nilsson, A. and Pettersson, L. 'Some Hypotheses Regarding Education and Economic Growth in Sweden During the First Half of the Nineteenth Century' in Torella, G. (ed.) (1990), pp. 209-222.

OECD The Well-being of Nations The Role of Human and Social Capital Paris: OECD Centre for Educational Research and Innovation

Parker, R.H. and Harcourt, G.C. (eds) (1969) *Readings in the Concept and Measurement of Income* Cambridge: Cambridge University Press, with an introduction by the editors, pp. 1-30.

PCAST, 2004. The President's Council of Advisors on Science and Technology *Report on Information Technology, Manufacturing and Competitiveness*, January, located at <http://www.ostp.gov/PCAST/pcast.html>

Penn World Tables version 6.2 (1950-2003) - <http://pwt.econ.upenn.edu>

Rodrik, D. (1997) 'The "Paradoxes" of the Successful State' *European Economic Review* 41: 411-442.

Røed, K. (1997) 'Hysteresis in Unemployment' *Journal of Economic Surveys* 11(4):389-418.

Sandberg, L. (1982) 'Ignorance, Poverty and Economic Backwardness in the Early Stages of European Industrialization' Variations on Alexander Gerschenkron's Grand Theme' *Journal of European Economic History* 11: 675-698.

Schuller, T. 2007 Reflections on the Use of Social Capital *Review of Social Economy* LXV (1) March: 11-27.

Sen, A. (1981) *Poverty and Famines: An Essay on Entitlement and Deprivation* Oxford: Clarendon Press.

Sen, A. (1997) 'Editorial: Human Capital and Human Capability' *World Development* 25 (12):1959-1961.

Sen, A. (1999) *Development As Freedom* Oxford: Oxford University Press.

Sen, A. (2003) 'Forward' in Fukuda-Parr and Shiva Kumar (2003): vii - xiii.

Sianesi, B. and Van Reenen, J. (2003). The returns to education: macroeconomics, *Journal of Economic Surveys*, 17, no. 2.

Skott, P. and Auerbach 1995 Cumulative Causation and the 'New' Theories of Economic Growth *Journal of Post Keynesian Economics* 17 (3): 381-381-402.

Stiglitz, J. (2005) 'The Ethical Economist'. Review of Friedman, Benjamin (2005) *The Moral Consequences of Economic Growth*, Knopf, in *Foreign Affairs*, November/December.

Strauss, J. and Thomas, D. (1998) 'Health, Nutrition and Economic Development' *Journal of Economic Literature* XXXVI(2) June: 766-817.

Streeten, P. (2003) 'Shifting Fashions in Development Dialogue' in Fukuda-Parr and Shiva Kumar (2003):92-105.

Temple, J. (2001) 'Growth Effects of Education and Social Capital in the OECD Countries' *OECD Economic Studies* No.33/II: 57-101.

Tortella, G. (ed.) (1990) *Education and Economic Development Since the Industrial Revolution* Valencia: Generalitat Valenciana.

Tortella, G. (1990) 'Education and Economic Development Since the Industrial Revolution: A Summary Report (The Less Developed Countries)' in Tortella, G. (ed.) (1990), pp.3-13.

Townsend, P. (1979) *Poverty in the United Kingdom* Harmondsworth: Penguin.

UNCTD (1997) United Nations Conference on Trade and Development *Trade and Development Report*

UNDP (2005). Human Development Reports - http://hdr.undp.org/statistics/data/excel/hdr05_table_2.xls

Wößmann, L. (2003) 'Specifying Human Capital' *Journal of Economic Surveys* 17(3): 239-270.

Young, A. (1995) 'The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience' *Quarterly Journal of Economics* August: 641-680.

¹ These critics suggest that growth must be weighed against welfare considerations surrounding income distribution and various forms of market failure.

² See, for instance IMF (2006), a special issue devoted to ‘understanding growth’, in which ‘growth’ is identified with changes in per capita GDP without contestation.

³ In principle, it is possible that a measure of economic growth will be satisfactory even if there are problems with our measurement of national income: the late Professor Alec Nove’s famous ‘law of equal cheating’ suggests that if the same flaws emerge every year in a national income measure and remain at the same magnitude, they will not affect our growth rate measures. In the discussion here, however, we shall remain aware of the difference between the problems in the measurement of levels of national income and rates of change of this magnitude, but will largely presume that the problems in the evaluation of these two measures are intimately related.

⁴ See Sen (2003:xi), who attributes the distinction to Hicks (1940).

⁵ Of course, a ‘true’ calculation of firm assets takes us into the mysterious realm of stock market valuation. ‘Actual’ profits in a given year will be needed to show changes in a firm’s ‘true’ assets.

⁶ A host of conceptual issues are posed here, such as the question of whether $K_2 - K_1$ (the difference in the value of assets at the beginning and the end of the period) is to be approached from the perspective of expectations, as opposed to the ‘actual’ values of $K_2 - K_1$, and the difficulties of giving an objective measure to the notion that the capital stock is left intact (corresponding to Hicks’s notion that the individual can expect to be as well off at the end as at the beginning of the period). Most of these difficulties will be put to one side here until some of them surface again in the latter part of this paper.

⁷ For the reasons explained in this section, the introduction of the term ‘human assets’ here is to distinguish it from the more narrow term ‘human capital’ commonly found in the literature.

⁸ Modern discussions deal with this question in the context of the meaning and measurement of poverty: see Townsend (1979) and Sen (1981).

⁹ ‘Nutrition, health and education are important for fuller labour utilization... They have been neglected because in advanced societies they count as consumption and have no effect on human productivity. The only exceptions that have been admitted in the literature until recently are some forms of education’ (Streeten 2003: 95).

¹⁰ This issue is discussed in the context of developing countries in Strauss and Thomas, 1998, though it is relevant as well in the context of rich nations. The redistributive policies of the Asian ‘tigers’ prior to ‘take-off’ (to be discussed below) have been important prerequisites of their subsequent success, and have generated a rethinking of the traditional presumption of a positive association between inequality and growth. The rethinking (e.g. Aghion and Garcia-Penalosa, 1999) touches only obliquely on the question of human assets. Galor and Moav, 2004, however, posit a link between income equality and human capital accumulation due to the presence of physiological constraints at an individual level that impose diminishing returns on the latter process.

¹¹ The hysteresis effect of unemployment is of a similar kind: long term unemployment as a device for macroeconomic stabilisation runs the risk of deteriorating skills on the part of the unemployed population – a running down of their stock of human assets (for a survey, see Røed, 1997).

¹² See Amsden, 1992 for the case of South Korea; UNCTAD, 1997, p.70 notes the cases of a number of developing countries with egalitarian land distribution that have experienced slow growth and indicates that this failure was due to the absence of concomitant policies concerning skill acquisition and education. The older literature from Kuznets, 1955 found an empirical relationship between inequality and growth: its potential rationale (from inequality to saving to growth) would appear irrelevant in the contemporary context of the widespread availability of international financing, and its statistical validity has been questioned (Lundberg and Squire, 2003).

¹³ See Björklund and Jäntti 1997 for a U.S. – Swedish comparison; in a time series context, rising U.S. inequality has constrained access to (higher) education and therefore limited income mobility: see Delbanco 2007.

¹⁴ As a matter of public policy, such a presumption limits the justification for aid to education from a traditional economics perspective (in the presence of imperfections in the market for human capital) to questions of income distribution. Galor and Moav (2004), however, posit a link between income equality

and human capital accumulation due to the presence of physiological constraints at an individual level that impose diminishing returns on the latter process.

¹⁵ The external effects discussed here are limited to those of a strictly ‘economic’, or productive nature.

¹⁶ The enhanced ability of French and Italian consumers to monitor food quality compared with other groups in Europe (e.g. the British) raises the problem of knowledge not due explicitly to education, and the spectre of possible deterioration of certain ‘traditional’ skills in the modern world.

¹⁷ Lucas (1988, pp.35-39) makes a similar point in the context of cities.

¹⁸ On the importance of female literacy for economic development, see Dasgupta, 1993.

¹⁹ The approach taken here has clear affinities with the ‘diffusionist’ approach to education and growth in the economic history literature (see Tortella, 1990, p.10-11) and to aspects of the ‘new’ economic growth literature (Lucas, 1988).

²⁰ There is some controversy surrounding the traditional view that Sweden was an exceptionally poor European country in the mid nineteenth century (Nilsson and Pettersson, 1990).

²¹ Armstrong, *et al.* 1991, claim that the extent of this physical destruction has been somewhat exaggerated.

²² See Auerbach 2005.

²³ For reasons given in our discussion of income distribution above, we disagree with Mazumdar 2003, 540 that accretions to income to both rich and poor should be considered equally in terms of their enhancement of social capabilities.

²⁴ The logarithmic transformation has been applied to the average income of the nation and not to individual incomes (Anand and Sen 2003: 140). If the latter calculation were used, the GDP per capita component of HDI would have an additional element weighting in favour of nations with egalitarian income distributions.

²⁵ On the data sources and statistical rationale, see Daly, 2006.

²⁶ OLS is a satisfactory procedure here because there is no a priori reason to believe that our explanatory variable is correlated with the disturbance term.

²⁷ Was the blues singer Robert Johnson ‘illiterate’? In the formal sense he undoubtedly was, even though his refined and poetic use of language has made a good deal of money for others, if not for him.

²⁸ Much of the material below is adapted from Auerbach and Skott (1995). Some felicitous details (emanating from Professor Skott) have been omitted.

²⁹ Few would contest the presumption that inputs were used inefficiently in the historical context of the centrally planned economies. Why is this possibility excluded *a priori* for market economies?

³⁰ The important role of state action in this context is discussed in Rodrik (1997).

³¹ The question quickly enters into the realm of metaphysics: can one define a meaningful *ex ante* best-practice production function, as opposed to an *ex post* listing of inputs and outputs, and claim that, empirically, the changes in inputs tend to be associated with more or less predictable changes in output?

³² Even in the context of technological change itself, the skills needed for the commercial adaptation of technology – the extraction of the full value of new technology to the ‘frontier’ - appear to be broad-based, including facility in production, marketing and finance, rather than being an exclusive focus on R&D work (Nelson and Wright, 1992).