

“Health and Economic Growth: Findings and Policy Implications”

The role of health on economic growth.

An Introduction

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1. A preliminary overview on health and economic growth

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The evolution of economic growth theory has become inextricably linked to the evolution of economics itself, at least in as far as this provides an explanation for the wealth of nations. The works of Solow (1956) and Swan (1956), gave rise to a wide range of literature on economic growth and this in turn fueled the debate on the capital-production relationship and the properties that determine market equilibrium. Taking as a starting point the intertemporal optimization approach of Ramsey (1928), the contributions of Cass (1965) and Koopmans (1965) effectively transformed the classical growth model into a tool capable of analyzing optimum consumer behavior. However, the limitations of the neoclassical model in explaining long term growth and the persistent interest of economists in short term phenomena led to a dearth of ideas during the 70's, the nature of which were to change only in the second half of the 80's.

In the neoclassical model technological progress is exogenous and long term economic growth is directly related to diminishing returns to capital and this has limited the analytical capacity of the model and its empirical verification. The constant increase in the differences between rich and poor economies stimulated economists to look at new theories that they felt might explain this dynamic. As a direct result, a new family of theories emerged that were better capable of explaining long-term growth. Central to these models is the idea that technology is endogenous to the growth process. Since endogenous technology determines economic growth in an endogenous way they are known as "endogenous growth models." The first of these models was published by Romer (1986). The concept of technology here depends on economic factors such the capital-labor relationship. An increase in this ratio explains not only an increase in income but also the ability to maintain high levels of growth in the long term.

From the early 90's various studies have attempted to identify the determinants of economic growth. Many variables have been tested, but only a few have been accepted

as being economically and statistically significant in explaining growth. Theorists generally accept human capital to be one of these variables. The role of human capital is almost universally regarded as being indispensable to the engine of economic growth. Sustained growth depends on levels of human capital whose stocks increase as a result of better education, higher levels of health and new learning and training procedures. Without a labor force with the minimum levels of education and health, a country would not be capable of maintaining a state of continuous growth. The effects of human capital variables imply that the investment rate tends to increase as the levels of education and health rise. Both these variables evolve systematically according to levels of development, and these changes may be linked to increases in the investment rate. A more highly educated, healthier workforce finds it easier to create, use, and adapt new technologies. Poor countries have lower levels of human capital and therefore have greater difficulties in competing with those that are more highly developed. In order to foment growth in poorer economies their levels of human capital must begin to converge with those of richer nations.

Right up until the second half of the 1990s the role of human capital was, in the main, linked to education, although a few authors recognized the importance of other factors such as health and nutrition. Mankiw, Romer and Weil (1992), in a groundbreaking analysis, cite the importance of including health and nutrition together with education in a broader concept of human capital. There was however a delay of several years before the link between economic growth and health became widely accepted as a licit field of economic debate. Fogel (1994), Barro and Sala (1995) and Barro (1996) were among the first in examining the relationship between economic growth and health, and their research has subsequently given rise to a substantial store of work focusing on the link between wealth and health.¹

Good health is a crucial component of well-being. However, improvements in health status may be justified on purely economic grounds. It seems to be a logical assumption that good health raises human capital levels and therefore the economic productivity of individuals and a country's economic growth rate. Better health increases workforce productivity by reducing incapacity, debility, and the number of days lost to sick leave, and reduces the opportunities an individual has of obtaining better paid work. Further, good health helps to forge improved levels of education by increasing levels of schooling and scholastic performance. There is also an important knock-on effect in that the resources that would otherwise be used for preventative health treatments are freed for alternative uses or in cushioning the effects of other negative externalities such as poverty within the community.

To gain a more adequate understanding of the accumulation process driving health human capital and wealth it is essential to know how the causal relationship between the two works. The main difficulty in any approach to this task lies in the possible existence of endogeneity between health and wealth. While good health may be considered as a form of human capital that has a beneficial effect on productivity, income also influences health in a positive way. The capacity to generate higher earnings facilitates an increase in the consumption of health related goods such as adequate alimentation or medicines. There is also an indirect effect on health via the improvements inherent in changes in life style, a more intensive participation in the work place, higher levels of education for the individual, all of which promote higher health levels through increases in income.² The nature of this feedback creates a number of problems when it comes to carrying out estimations for the impact that health has on economic growth.³

Over the last few years a variety of theoretical and empirical research has given rise to a large body of literature that provides evidence supporting the thesis that health

exerts a positive effect on wealth. In analytical terms several infinite-horizon and finite-horizon models have been developed, which attempt to analyze the accumulation process of health and economic growth. In the basic setup the household-producer does not decide on the amounts of money the household saves or invests in human or physical capital. In the models in which individuals attempt to maximize their utility on the other hand, investment in human capital may have a direct impact on the individuals carrying out that investment or they may decide to act more altruistically by investing in the human capital of their children. These lines of research have led to models that, by considering the specific characteristics of consumption and production of the economy, are capable of assessing the direct and indirect influence that individual health and education investment decisions have on present and future generations. The positive effect of health on economic growth is identified either in exogenous growth models during the transition to the steady-state or in endogenous growth models, within the context of intertemporal optimization.

In the empirical discussion, macro and micro studies analyze whether different health indicators are positively linked to different dimensions of economic growth. On a macroeconomic level, both within-country and cross-country analyses measure the effects of different inputs on total economic output. These inputs include human capital which is given jointly as a combination of health and education. These studies come up against specification problems that arise by attempting to simultaneously analyze health and education due to the aggregate effects of health or to reverse causation.

On a microeconomic level, many studies have analyzed the impact of health on wages. Different health indicators are used and range from anthropometric measures such as weight, height, the BMI, and measures based on surveys that report factors such as self assessed health status, whether the individual is suffering from a particular

chronic illness, or whether their main activity is impaired or limited. These studies are based on the idea that healthier workers are less susceptible to disease, more alert, and more energetic and are consequently more productive and command higher earnings. The main problems in these kinds of studies are normally derived from measurement errors when it comes to capturing the individual's health status, the heterogeneity of the variables and the possible feedback among them.

In addition to individual research some international organizations have set in motion their own initiatives to verify and measure the extent of the relationship between health and the accumulation of wealth. The Commission on Macroeconomics and Health spent two years analyzing the impact of health on development in an attempt to examine the channels through which health related investments might have a positive impact on economic growth and equity in developing countries. Two other important research projects were directed by the Pan American Health Organization and the Inter-American Development Bank. Both focused on Latin America and the Caribbean. The former dealt with the impact of health on long-term economic growth and the latter on the impact of health on household productivity. The Pan American Health Organization is currently carrying out Phase II of its Health and Economic Growth project. This undertaking looks at the relationship between the persistence of poverty and inequalities and human capital accumulation, and variations in economic growth and social development. These initiatives, besides generating an enormous amount of good quality research, have served to fill a void in existing literature.⁴

2. Investing in health

The literature on Health Economics and economic growth has shown the importance of the improvements of health in populations to reduce poverty and inequality in less developed (LDC) countries. In fact, once we account for the increase in life expectancy, at least partly

'free imported' from the more developed world a new picture emerges: inequality among rich and poor world have been much larger in absence of the improvement in health and the reduction of the burden of disease has been highly significant.

At any rate, a recent World Health Report 2003, recently published, has come to emphasise the magnitude of the work to be done: The gap in life expectancies between rich and poor countries is widening. A baby born today in Japan can expect to live for 82 years, with 92% of that time in good health. In Sierra Leone, however, average life expectancy at birth is mere 34 years, more than five of those years (a 16%) spent in ill health. Similarly in Angola and Afganistan. In Russia, closer to the West is 59 years, 61 in Turkey. While AIDS is the main killer in Africa, heart disease and other non-communicable conditions are having the effect elsewhere. International assistance is advocated in poor places without delay.

Indeed, for LDC to invest in health means often to escape from the poverty trap. Public health and epidemiological programs help indeed to move the current 'state of affairs' of LDC, in creating complementarities on other forms of human capital, as education or sustainable fertility rates for families. Indeed, it is today well documented how increases in life expectancy affects parents decisions to invest in their children's education, by lowering the expected losses from infant mortality. As a result, women may reduce birth rates since not so much need of replacement of family labour force is required. All this by itself increases per capita income. In addition, more educated and healthy population increases productivity, with income to be shared amongst less impoverished people.

Investing in health may shift in this sense, the production possibility frontier of a society. Wealth creation which was considered not to be possible before, may then be. New products may start to be valued for consumption, once survival is assured and per

capita income increased. Under preferences for higher income elasticity goods, quality aspects of life reach the citizens' consumption baskets. So when people age, as a proof of the general health improvement of the population.

In the developing world, investing in health means also higher labour productivity. Even under decreasing marginal returns, fighting obesity, alcohol abuse, smoking, drug addiction and lag of exercise improves the industrial output, lowering absenteeism and reducing human capital losses (and social investment opportunities) for the economy. No need to say the importance of saving pain and suffering to society, allowing for health expenses on chronic conditions to be devoted to some other aspects of community welfare.

When building an global strategy to invest in health, either by devoting international aid to LDC or by increasing money from consumers and taxpayers on health finance, *targeting* should not be the exception but the norm. Indeed, aid needs to focus on selective population groups, such as family members responsible of the group (women, income earners, with young parents with dependants) as the World Bank does when allocate priorities according to the global burden of disease. Less accessible isolated areas need to be prioritised too. Public Health and Primary Care, together with basic education and health prevention should be paramount. They may not save deaths at the case-by-case level, but their externalities and indirect benefits make for an always worthy investment. Public resources need to be first concentrated to insure against the catastrophic consequences of illness, just the opposite of more of our NHS public systems, which are rather good on full coverage from minor acute health problems, and much less on chronic conditions and mental health (at least in Spain!). Public solidarity funds should at the margin benefit more to more deserved-needed population. This goes badly with the idea of universalism and free access in health care, at least when this is understood as 'free bar' ("barra libre") for services

Investing in health cannot be identified, as we have commented here, with higher health care (public) expenditure. Investing in health is much more than to spend on health care. It needs a fully comprehensive strategy, a well adapted tactic to address health population targets and a more complete agenda to close the gap between efficacy in the laboratory of ideas and effectiveness, in the real world.

3. Scope and structure

Recently, the field of health economics has given rise to an increasing amount of research that has focused on the relationship between health levels and economic growth. The growing interest shown both by fellow researchers and students in the overlapping areas that affect the relationship between health status and economic growth has been the prime stimulus to the preparation of this book.

The volume is a practical, wide-ranging work of reference that marries the fields of health economics and growth theory. As such, the volume is aimed at researchers, students, and professors of undergraduate and graduate courses in Economics, Health Sciences, Social Sciences and Public Affairs, together with all those simply interested in the most recent and innovative lines of economic research.

The book aims to explore the mechanisms by which a population's health status affects a country's economic performance in terms of economic growth and social development. Basically, the volume looks at the impact of health on economic growth and development and analyzes the nature and magnitude of the economic outcomes of investing in health. It gives scope to the most recent initiatives in the field both on a theoretical and empirical level. Theoretical analyses attempt to decipher the complex relationship between endogenous growth, health and demographics. From an empirical viewpoint, there is an attempt to assess the incentives for investing in health. In this

sense the volume deals with health indicators, nutrition, income distribution, poverty traps and the case of HIV/AIDS and brings together many of the lines of research that have come to the fore in recent years within the fields of growth and health.

The volume is divided into five sections each of which deals with a distinct facet of the relationship between health and economic growth. As the main lines of study are closely linked in many cases, there is a certain overlapping that serves to highlight the interconnectedness of all of the elements in the field. At the same time the proximity of each of the sections allows the reader to take a cross-section of the contributions according to specific individual interest. The chapters identify a set of dynamic relationships that exist between income, human capital, and demographic change. A knowledge of these relationships is essential to an insight into the process of social and economic development at the heart of much human progress. In a world in which the socio-economic differences between nations are becoming increasingly pronounced at an alarming rate, it is imperative to reach a deeper, rigorous understanding of the causes of these changes and to be able to analyze the dynamics that underlie them.

In the first set of works presented in section 1 entitled, *Health, Human Capital, and Economic Growth*, focuses on economic growth theory and the channels through which human capital generates both higher income and individual well-being. Models of economic growth have been extended to include the importance of health as a human capital input. All these initiatives are a product of advances in both economic theory modeling and improvements in the quality of data. An increase in levels of education generates improved productivity and this in turn raises incomes. Good health also promotes regular school attendance and optimizes scholastic performance. Healthier individuals have higher life expectancies and, as a consequence, have greater incentives to invest in improving their life skills since this investment will be likely to have a

longer lasting impact. In contrast with schooling, health varies over life span and is the result of behavioral choices both during child and adulthood. These factors are explored in the economic modeling that makes up the body of the following three chapters. The section presents three distinct endogenous economic growth models that shed light on the way that health affects economic growth.

In chapter 1 in *Health, Human Capital and Economic Growth: A Schumpeterian Perspective*, Peter Howitt sets up a simple model of innovation-based “Schumpeterian” growth theory that contains six different channels through which an improvement in a country’s population health will affect a country’s long-run growth performance. With one possible exception these effects all work in the same direction. Specifically, they raise the productivity and per-capita GDP (both relative to the world technology leaders) of a country that is sufficiently well off to be growing at the same rate as the world technology leaders, they raise the growth rate of per-capita GDP in a country whose growth rate is below that of the technology leaders, and they allow some countries finally to stabilize the relative gap in living standards that separates them from the technology leaders. The effects that are new to Schumpeterian theory are those that work through the equilibrium rate of innovation, especially those that impinge directly on creativity and coping skills. In this respect, this chapter underscores the importance of recent research showing the beneficial effects that early childhood health and maternal health have on these critical dimensions of human capital.

In chapter 2 entitled *Health as a Principal Determinant of Economic Growth* Adriaan van Zon and Joan Muysken develop an endogenous growth model based on Lucas (1988) and van Zon and Muysken (2001). The model shows how the provision of health services influences an economy's rate of growth. Since growth is produced using labor services that have alternative uses, increasing health activities also implies

lowering output and possibly growth. At the same time good health is necessary to be productive at all. Hence there is a direct trade-off between the health state of the population and growth performance. The authors add a stylized demographical and epidemiological module to the Lucas model that enables us to distinguish between care activities and cure activities. The chapter illustrates how changes in the rate of morbidity and the rate of mortality influence the optimum allocation of scarce (labor) resources over its various uses that include care, cure, final output production and human capital accumulation activities. Finally, the authors conclude that human capital accumulation is still the ultimate source of growth, but the health sector is instrumental in realizing the potential of the productive human capital embodied in the population.

The first section ends with, *Health's Contribution to Economic Growth in an Environment of Partially Endogenous Technical Progress* by Dean Jamison, Lawrence Lau and Jia Wang. The authors focus on the relationship among health, income variation and technological change. The chapter partitions reasons for cross-country variation in income levels into three components: Persistent factors influencing the level of output; time varying factors influencing the level of output (e.g. levels of health); and persistent factors influencing a country's rate of technical progress. Authors do this in the context of an assessment of the magnitude and nature of health's consequences for growth. Persistent factors are those that remain unchanged (e.g. geographical location) or that change only slightly in the time period being studied (e.g. potentially endogenous determinants of technical progress such as a country's orientation toward free trade). The chapter concludes that about 15% of recent growth resulted from mortality and fertility reductions. Improvements in health, measured by the survival rate of males between age 15 and age 60, results on average, in per capita income being

about 6% higher in 1990 than it would have been without the health improvements. This accounted for about 11% of countries' economic growth during the period 1960-2000.

In section 2 entitled *Macroeconomics, Development and Health* the authors identify the role of health as being central to long-term economic development, economic growth, and a reduction in levels of poverty. Higher life expectancies and low levels of disease tend to stimulate growth through accelerating the demographic transition, promoting investments in human capital, increasing household savings, and by augmenting domestic and foreign investment and greater social and macroeconomic stability. The three chapters that follow analyze the impact of health on development, economic growth, and equity. They place a special emphasis on the effects of child health and nutrition and how these affect life outcomes. The authors recommend health measures designed to minimize poverty and maximize economic development in developing countries.

In chapter 4 Xavier Sala-i-Martin presents, *On the Health-Poverty Trap*. This chapter analyzes the existence of a health-poverty trap in which poor health generates poverty and vice versa. Both health and economic growth are presented as key factors when it comes to achieving the three basic human rights: life, liberty and the pursuit of happiness. This chapter tries to argue that, health and growth are not simply fundamental determinants of human welfare, but are in fact so closely interrelated that it is impossible to generate economic growth in the developing world without solving the central health problems faced by these countries, and it will not be possible to improve health without generating economic growth. The chapter finally suggests micro and macro interventions aimed at promoting health, growth and poverty reduction as indispensable to act against poorness.

In *Human Development Traps and Economic Growth* in chapter 5 David Mayer-Foulkes examines the relationship between human capabilities and the emergence from stagnation into economic growth. This chapter discusses how cross-country examination of joint dynamics of life expectancy and income shows that a stratified emergence from stagnation continues today, marked by barriers to basic human development and to productivity. These observations are explained by a model in which human development interacts with technological change and is characterized by a sequence of market failures. These dynamic, intergenerational, human development traps make economic growth slower, stratified and transitional. The author also presents a microeconomic study on Mexico that finds evidence for an economy-wide, intergenerational, low human capital trap consistent with this model. The chapter concludes that the effects found for early childhood development on the acquisition of education, and therefore on adult income, are commensurate with the historical and macroeconomic findings mentioned above.

In chapter 6 Edward Miguel in *Health, Education and Economic Development*, analyzes the effects of child health and nutrition on determining life outcomes in underdeveloped countries and examines the use of public policies to break the cycle of poverty. The chapter presents a series of recent randomized evaluations in less developed countries that provide compelling evidence of a causal link between child health gains and educational outcomes. Evidence from a school-based NGO deworming project in Kenya and from a project providing iron diet supplements in India, indicate that health gains lead to substantial improvements in schooling attendance. Edward Miguel provides evidence that both child health shocks and parental death have large impact on education, in particular on school attendance and enrollment, across a range of African, Asian and Latin American settings.

In chapter 7, Harold Alderman, Jere Behrman and John Hoddinott in *Nutrition, Malnutrition and Economic Growth*, examine the potential channel through which nutrition and health may affect economic growth. This chapter first assesses estimates of the extent of malnutrition in developing countries. It then surveys micro evidence about the productivity impact of improved nutrition in developing countries, from conception through infancy and childhood and into adolescence and adulthood. These gains may operate through many channels by stimulating increases in cognitive development, physical stature and strength, earlier school enrolment and more regular school attendance, and in adult productivity. There is a consequent saving in resources that would otherwise go towards dealing with disease and problems related with malnutrition. Finally the possible gains from different nutritional policy strategies and the policy bases for adopting such strategies are also examined. Their study supports the use of nutritional policy to attain better pro-poor distributional goals by helping to make individuals from poor families more productive over their life cycles.

The following section, *Human Capital, Health and Demography* analyzes demographic and epidemiological transitions. The links between a population's human capital levels and fertility and mortality rates are crucial to the formulation of social and economic policies that are capable of guaranteeing development, combating misery, and ensuring human dignity. Infirmary and illness associated with maternity and early infancy, unwanted pregnancies, illiteracy and discrimination against women are all linked to high fertility levels and elevated population growth. Without addressing these symptoms sustained economic growth is practically impossible. Chapters nine and ten provide models that analyze the demographic and epidemiological growth processes. These studies present a way of understanding the feedback mechanisms operating between income, human capital, and demographic change. The data supplied by these

models is of special importance when it comes to formulating policy aimed at human and economic development.

Chapter 8 presents the work *On Epidemiologic and Economic Transitions: A Historical View* by Suchit Arora. In this chapter the author reexamines some of the keystones of the Epidemiologic Transition. The chapter discusses long-term trends (based on annual data) of disease-caused mortality in the United Kingdom between 1850 and 1994. The author has compiled a data set that helps delineate the epidemiologic transition for the U.K. and uses the framework as a means of analyzing the potential benefits and pitfalls of this kind of data for human-capital-based theories of long-term economic growth. The usual approach to this problem is via life expectancy variables. The chapter attempts to delve a little deeper, by commenting on the diseases that have contributed to the continuous rise of life expectancy from the beginning of the nineteenth century together with a look at the diseases which have impeded its progress since then. The discussion includes salient historical developments (household and social choices, institutional developments, scientific achievements such as the germ theory of diseases etc.) that have helped to bring about an increase in the human life span since the nineteenth century. The attempt therefore is to move away from summary-measures such as life expectancy and aggregate mortality towards more micro-level trends that drive life expectancy itself. The author concludes that the consequences of health related improvements have determined important intergenerational effects in the population. Throughout the nineteenth century, the emergence of human capital, particularly in the form of health, has influenced the behavior of economic growth permanently.

In chapter 9 Oliver Morand, in *Economic Growth, Health and Longevity in the Very long Term: Facts and Mechanisms*, proposes a simple framework that integrates

health investments to a standard growth model where physical and human capital are the combined engines of growth. The author explores the relationship between economic growth and health through a theoretical model characterized by the existence of two growth regimes separated by an epidemiological transition. The transition itself may follow one of three different patterns and may also induce an economy to switch to a modern growth regime. The model shows that health transition can help a country switch from a neoclassical growth regime to a modern growth regime. It suggests that health policies in developing countries can have important consequences for long term growth and not only for immediate well-being of the population. Measuring the returns to health investments simply in terms of increases in life expectancy would lie to underestimate the true returns to health expenditures because it ignores the induced effects on education. Policies aimed at generating economic growth should combine education and health policies since rising life expectancies lead to increases in investment in education and longer more complete periods of schooling.

Section 4 is entitled *Productivity, Labor Markets and Health* and discusses how better health affects labor productivity and wages in labor market outcomes. Health as a form of human capital influences the wage levels of individuals and their capacity to generate sustained income over time. The following three chapters aim to quantify the labor market returns that positive health status induces. Poor health tends to prejudice the poor far more than the well off, and this is particularly true when it comes to labor market opportunities. An insight into the nature and depth of the links between health and labor outcomes provides an important channel through which to formulate and carry out policies aimed at optimizing labor efficiency. Poor health reduces the physical and mental capacities of workers and this gives rise to lower productivity and lower wages.

Further, problems arising from chronic ill health can lead to individuals falling foul of the poverty trap given that they may find it difficult to keep their jobs

Chapter 10 is presented by Paul Schultz. In *Productive Benefits of Improving Health: Evidence from Low-Income Countries* various household survey indicators of adult nutrition and health status are analyzed as determinants of individual wages. According to the author, survey indicators of health status may be heterogeneous, or a combinations of health human capital formed by investment behavior, and variation due to genotype, random shocks, and measurement error, which are uncontrolled by behavior. In this sense, although there are no definitive methods for distinguishing between human capital and genetic variation in health outcomes, alternative mappings of health status, such as height, on community health services, parent socioeconomic characteristics, and ethnic categories may be suggestive. Instrumental variable estimates of health human capital and residual sources of variation in measured health status are included in wage functions to assess empirically whether the productivity of both components of health are equal. The chapter provides evidence from Ghana, Cote d'Ivoire and Brazil that suggests that the health human capital effect on wages is substantially larger than that associated with residual health variation.

In chapter 11, Berta Rivera and Luis Currais in *Individual Returns to Health in Brazil: A Quantile regression Analysis* explores the links between health indicators and labor productivity at different levels of earnings' distribution in Brazil. They use extensions of instrumental variables techniques in order to carry out a quantile regression on a sample of workers so as to estimate the returns of health at different quantiles of the conditional distribution of wages. The authors use different indicators as a proxy of health status. The implications of good health and the determinants of health production functions are studied in order to test whether there is individual

heterogeneity in returns to health or conversely, if there are constant returns for all workers.

The case of Brazil is particularly interesting because of the idiosyncrasies of the country in terms of inequality and with respect to the way the health system is organized. Economic inequality in Brazil is among the highest in the world and the implications for the health and well-being of the population are manifold. For instance, economic inequality is reflected in the relative access and utilization of health services as well as in the health conditions of individuals across income groups.

Given the economic and social ramifications of AIDS, the pandemic warrants special consideration. The final section of the volume, entitled *Quantity of Life and the Welfare Costs of AIDS*, discusses the effects of the disease on populations, specifically on the quantity of life and well-being of individuals and also assesses future perspectives in terms of incentives for developing new treatments. AIDS is a particularly devastating disease, and in under developed countries it is by far the most deadly, the most economically damning, and the surest barrier to growth. AIDS affects populations in terms of both direct and indirect costs. The disease itself has to be treated, there is boundless individual suffering, and there is an acutely deleterious effect on the workforce, especially in Africa. According to the Macroeconomics and Health Commission Report (2001) three million people died of AIDS in the year 2000 and a staggering 2.4 million of these deaths were in sub-Saharan Africa. The number of children in Africa that have been orphaned by the disease has reached twelve million and predictions point to a figure of 40 million by the end of 2010. Unless more effective measures are undertaken to curb AIDS the social and economic effects, particularly for the African continent, will be dramatic.

Chapter 12, entitled *The Quantity of Life and the welfare Cost of AIDS in Sub-Saharan Africa*, by Tomas Philipson and Rodrigo Soares reviews the “value of life” methodology, and describes how it can be used to assess the evolution of welfare across countries when changes in health are a relevant dimension. It then applies this methodology to estimate the welfare cost of AIDS in Sub-Saharan Africa. More than 70% of the population afflicted by AIDS in the world is in Africa, and the vast majority of those are in the Sub-Saharan region. The chapter uses AIDS death statistics from the UNAIDS, and life tables from the World Health Organization to estimate counterfactual mortality rates that would be observed if AIDS did not exist. It then uses the marginal willingness to pay approach from the “value of life” methodology to estimate the welfare loss from the changes in mortality rates brought about by the AIDS epidemic. The results indicate that the welfare cost of AIDS in Sub-Saharan Africa is of the order of \$800 billion, or equivalent to one year of aggregate production for the whole region. This value eclipses any available estimate of the direct financial cost of AIDS.

In chapter 13 in *Profits and People: On the Incentives of Business to Get Involved in the Fight Against AIDS* David Bloom and J. Sevilla discuss the motivation for private firms to play an active role in the struggle against HIV/AIDS. The authors suggest that there is a considerable disparity between the potential and the actual contributions of firms to the world’s effort against AIDS. In this sense, they find that, there is a gap between the financial incentives firms have to get involved, and the social benefits that would come from their doing so. This gap is not due to shortsightedness in business know-how. It comes from an externality, an inherent difference between the interests of business, making profits, and in society’s fight against AIDS. It is true that businesses have an interest in combating the epidemic, and that the international community will likely have some sway over business in encouraging action on AIDS. Nevertheless, to

engender large-scale, effective action on the part of business, policymakers must take into account the incentives that firms have or lack in the course of their operations. Economic theory provides a way of thinking about possible solutions in order to improve business participation. The general principle is that one ought to build a public-private partnership that capitalizes on the relative strengths and comparative advantages of states and business enterprises. The chapter highlights that states are the natural designers of such alliances. And because of their skills in mobilizing resources, innovation, marketing, and distribution, businesses can carry out the work agreed upon.

Notes

1. Among them, Schultz (1997), Strauss and Thomas (1998), Bloom and Canning (2000), Bhargava et al. (2001), Case (2001), Mayer-Foulkes (2001), Weil (2001), and van Zon and Muysken (2001).
2. The effects of causality can also be observed through the economic impacts generated by maternity and fluctuations in the levels of women entering the labor market, a dynamic that may have secondary impacts on education.
3. The existence of a feedback effect between these two variables is documented in a wide number of studies. See for instance Wheeler (1980), Bherman (1990), Currais and Rivera (1999), Adams *et al* (2003) and Meer *et al* (2003).
4. Some of these results can be found in Savedoff and Schultz (2000), Pan American Health Organization (2001) and World Health Organization (2001).

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