

A Review of Angus Deaton's *The Great Escape: Health, Wealth, and the Origins of Inequality*[†]

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This book explores the relationship between the material standard of living and health, both across countries and over time. Above all, Deaton is interested in the question of whether income growth contributes significantly to better health. His answer is no: saving lives in poor countries is not expensive, and there are many episodes of massive health improvements in the absence of income growth. As an alternative, he argues that the cross-sectional correlation between health and income is induced by variation in institutional quality, while over time, parallel improvements in income and health have been a result of advancing knowledge. (JEL E23, I12, I14, I15, O15, O47)

1. Introduction

Robert Lucas famously wrote of economic growth that once you start thinking about it, it is hard to think about anything else. But what is economic growth?[‡] One aspect of growth is change in the goods and services that an economy produces. Compared to our ancestors, or to most of the other residents of our planet, those of us who live in developed countries today enjoy the benefits of a much better consumption basket: big houses, cars, air conditioning, restaurant meals, and so on. These are the things that are captured in conventional measures

of GDP per capita, for which we can calculate compound growth rates and, with somewhat more difficulty, make comparisons across countries. Another dimension along which there has been enormous change over time is human health. Reminding oneself of the ubiquity of premature death, suffering, and disability that characterized the lives of previous generations, and that still characterizes the lives of many people in developing countries today, is a good way to get some perspective on the importance of income as measured in conventional GDP.¹

Whether one includes health improvement as part of “economic growth,” or

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[‡] Go to <http://dx.doi.org/10.1257/jel.53.1.102> to visit the article page and view author disclosure statement(s).

¹ A brave soul might even ask how these improvements compare in terms of their effect on human welfare. See Weil (2014) for a discussion of this literature.

whether one restricts that term to apply only to income, is just a matter of labeling. But there is a related substantive question: What do the material standard of living and health have to do with each other? *The Great Escape* tells the stories of the enormous improvements in health and income that have taken place in the last few centuries, and of the huge gaps that persist today, both between and within countries. At the book's core is an examination of the causal relationship between income and health, and particularly the question of whether increasing income in poor countries is a good way to bring about health improvement. Deaton's answer is, in brief, that income affects health outcomes much less than you probably think.

This review focuses on the relationship between income and health, but it would be a disservice to the potential reader to give the impression that this is all that the book is about. In fact, *The Great Escape* encompasses a far broader range of topics. Deaton embeds both health and wealth in a framework of "well-being," and discusses how to define and measure this concept. He also addresses other measurement problems, including international comparisons of income and the construction of poverty thresholds. Issues outside the usual domain of economics, both moral (for example, the extent of a person's responsibility to help others in need) and philosophical (how to evaluate the welfare consequences of a larger population) are touched upon, as well. Throughout the book, there is a persistent focus on the welfare of those worst off. The book's overarching metaphor, and the source of its title, is the idea that humanity's escape from material deprivation and premature death has been tied up with inequality: at first, only a few escape, and many are left behind.

All of these topics are woven together in an elegant narrative, written at a level that

undergraduates and lay people can easily understand, but also enlightening and challenging to even the most experienced scholar. Deaton takes the reader on a richly detailed tour through a landscape of historical narrative, science, data from across the world, and scholarly debate. And he is a superb guide: erudite, lucid, humane, and witty.

2. *Health and Wealth*

Improvements in health and economic growth (in the narrow sense of rising income) have much in common in terms of their timing, geographical origins, spread, and underlying causes. The sustained economic growth that began in Europe with the Industrial Revolution was preceded by millennia in which the conditions of life hardly changed at all, and in which cross-country differences were relatively modest. The material standard of living has been utterly transformed in the countries that started growing first, and enormous income gaps have opened up between countries. From its starting point in northwestern Europe, the contagion of economic growth spread to other parts of Europe and North America in relatively short order, and later to Japan and South America. In the post-World War II period, growth has spread further still, with late starters such as The Republic of Korea and China putting on great bursts of speed in which they grew at rates far greater than anything experienced by the early starters.

In the case of health, the pattern was similar. There is little evidence of trend change in health prior to the middle of the eighteenth century, unless one goes back to the transition from hunting and gathering to agriculture, at which time things got worse. And while there existed health differences among countries prior to industrialization, with the tropics being particularly unhealthy, the gap was small in comparison to what was

to follow.² The same countries that led the pack in terms of income growth saw health improve first, and as with income, many countries that started their health improvements later experienced gains at a speed far faster than anything the leaders had achieved. This was particularly true during the “international epidemiological transition” in the middle of the twentieth century, when a number of health technologies were transferred rapidly from the developed to the developing world (see Acemoglu and Johnson 2007).

There is also a similarly eerie constancy in the trend growth rates of income and health in the most advanced countries. As discussed by Jones (2002) and Lucas (2000), among others, the rate of growth of output per capita over the last 140 years in the United States (the world largest rich country for most of the period) has been nearly constant, at roughly 2 percent per year. Similarly, in the analysis of Oeppen and Vaupel (2002), life expectancy in the “best practice” countries (those with the highest life expectancy in the world) has increased linearly since 1840 at a pace of three months per annum, with no sign of a slowdown. In each case, these steady headline results reflect ferment beneath the surface. For life expectancy, the sets of diseases that were being controlled, the means used to conquer them, and the ages at which death was being rolled back have changed dramatically. In the case of income, increased investment rates in human and physical capital, massive structural change, the demographic transition, and a sea-change in the nature of R&D—what Jones calls a series of “grand traverses”—have netted out to constant overall growth. Whether these mysterious linear trends remain in place going forward is an issue that will have enormous impact on the welfare of residents of the most

advanced countries—but this is something that Deaton spends relatively little time on in his book, since his concern is more with those not lucky enough to be at the frontier.

The most notable relationship between income and health is in cross-country data. Preston (1975) first plotted and interpreted the relationship between income and life expectancy. Deaton begins his analysis by showing a plot of the “Preston curve,” and much of his book is devoted to thinking about what the curve means. The Preston curve certainly fits well. Using data from 2010, the correlation between the log of GDP per capita and life expectancy is 0.84 when countries are weighted by population (and only slightly lower if they are not weighted). The relationship is not far from linear, with a doubling of GDP per capita being associated with an increase in life expectancy of roughly five years. An interesting point is that the fit of the Preston curve has been improving over recent decades. Using data for 1980 (and the same sample as the previous calculation), the weighted correlation between the log of GDP per capita and life expectancy is only 0.52. Almost the entire improvement in fit can be attributed to a single country, China, which was an enormous outlier (high life expectancy relative to income) in 1980, and has since moved back in line. The correlation between income and life expectancy is echoed with other measures of health, including absence of anemia, fraction of babies that are low birth weight, and years lost to disability (Weil 2014).

There is also a significant relationship between income and health that is observable within countries. Gwatkin et al. (2007), pooling data from Demographic and Health surveys for fifty-six developing countries, show the wealth gradients for a number of health indicators. For example, the under-five mortality rate varies by a factor of almost two, from 135.4 to 73.5 per thousand, moving from the bottom to the top wealth quintile.

²Depetris-Chauvin and Weil (2013).

In the United States, mortality probabilities for most demographic groups fall with lifetime income (Cristia 2007). For example, men aged 50–64 in the top quintile have mortality probabilities 60 percent lower, and women 40 percent lower, than those in the bottom quintile. Other measures of health are also correlated with income. Height is often used as a summary measure of the cumulative effects of nutrition and health insults prior to adulthood. As Deaton shows, in developed countries, height has risen on average roughly ten centimeters since the middle of the nineteenth century. Within countries, height is correlated with income, the relationship being stronger in poorer countries. In the United States and United Kingdom, Case and Paxson (2010) estimate semielasticities of wages with respect to adult height (controlling only for ethnicity) of between 0.48 percent and 1.1 percent per centimeter. Vogl (2012) and Thomas and Frankenberg (2002) find semielasticities of wages with respect to height in centimeters of 2.5 percent in Mexico and 3.1 percent in Indonesia.

In addition to this between- and within-country variation, there is also the temporal covariation noted above: after millennia of stagnation, health and income began improving at roughly the same time. All of these data establish that in a statistical sense, income and health are certainly related. The question is, what is the nature of that relationship?

Any well-trained undergraduate can answer that question, at least in a superficial fashion: The correlation results from income causing health, from health causing income, from some other factor(s) causing both, or from some combination of these three channels. Putting that idea in a simple framework, we can think of income (y) and health (h) being simultaneously determined:

$$(1) \quad h_i = \alpha y_i + \mu_i$$

$$(2) \quad y_i = \beta h_i + \epsilon_i.$$

Discussion of the relationship between health and income can then be conducted in terms of the slope coefficients, as well as the variances and covariances of the two error terms. The next two sections of this review discuss these structural equations in turn.

3. *The Effect of Income on Health*

The idea that the Preston curve represents, at least in some significant part, a causal effect of income on health hangs over much of Deaton's book. It is an issue to which he repeatedly returns, in part because the idea is so seductive: "If the diseases of poor countries are indeed 'diseases of poverty' in the sense that they will vanish if poverty is reduced, then direct health interventions may be less important than economic growth. Economic growth would be 'twice blessed'; it would increase material living standards directly *and* improve health as a bonus." (p. 106). This is exactly the error away from which Deaton works hard to steer the reader.

Causality running from income to health could have manifestations in both the time series and cross-sectional domains. In the time domain, the idea was associated originally with Thomas McKeown, but was propounded most vigorously in recent years by Robert Fogel. Looking at the historical experiences of developed countries, McKeown famously claimed that the bulk of observed declines in mortality from a number of infectious diseases took place *prior* to the deployment of both medical treatments such as drugs and vaccines, on the one hand, and public health measures such as clean water, on the other. Fogel focused more specifically on nutrition, citing evidence on both caloric intake and changes in body size over time. A central pillar of his analysis is the so-called Waaler surface, showing the relationship

between height, weight, and relative mortality risk for middle-aged Norwegian men in the 1960s and 70s. Superimposing changes in average height and weight over the last two centuries on the Waaler surface (for example, the French went from roughly 161 cm and 45 kg in 1705 to 172 cm and 72 kg in 1975) predicts a large drop in mortality. Fogel (1997) calculates that this change alone explains 90 percent of the reduction in French crude death rates between 1785 and 1870, and a further 50 percent of the reduction between 1870 and 1975. Floud et al. (2011) calculate that over a roughly similar time period, age-standardized calorie consumption in France rose by 65 percent.

Deaton argues that McKeown was right about the large mortality declines from infectious diseases in early developing countries preceding the arrival of medical treatments, but not about their preceding the deployment of public health interventions. As an example of the importance of public health interventions, Cutler and Miller (2005) estimate that water filtration and chlorination alone accounted for 43 percent of the decline in mortality in a sample of U.S. cities over the period 1900–1936. While Deaton does not reject the idea that better living standards promoted better health, he downplays it. Indeed, Deaton's *Great Escape* began life as a review of Fogel's book, *The Escape from Hunger and Premature Death, 1700–2100*, in the pages of this journal (Deaton 2006). Among the pieces of direct evidence he brings to bear, he points out that until 1750, the well-fed British nobility had no higher life expectancy than the general population. He also argues that the bigger bodies on which Fogel focuses were the result not only of more nutrition, but also less infectious disease.

The most important piece of evidence against the Fogel/McKeown view is the one noted by Preston himself in his original article: the shifting upward over time

in the relationship between life expectancy and income. The increase in life expectancy experienced in a country over time can be decomposed into the part due to higher income (movement along the Preston curve), and the shift in the curve itself. Preston's calculation was that less than one quarter of the average mortality improvement observed between 1930 and 1960 was due to movement along the curve, with the remainder due to shifts in the curve. In other words, income gains were not the primary source of health improvements (although it is worth noting that the Fogel/McKeown argument is primarily meant to apply to a period prior to the one examined by Preston).

Deaton's own narrative of the health improvements over time puts less weight on nutrition and more on knowledge. In particular, he focuses on the improved understanding of disease and its control as the driving force that produced the greatest improvement in life expectancy. In this story, no scientific advance is more important than the germ theory of disease, which allowed for the introduction of effective public health infrastructure, particularly clean water, as well as numerous other changes in behavior that reduced the burden of infection. Other vital pieces of knowledge include:

- The discovery that smoking was harmful for health, made salient by the U.S. Surgeon General's report of 1964, although much of the information was available before then
- The development of a series of cheap, effective treatment regimens for managing high blood pressure, which produced a massive decline in death rates from cardiovascular disease in developed countries after 1970
- Oral rehydration therapy for diarrhea, invented in 1973 during a cholera outbreak in Bangladeshi and Indian refugee camps, and described by *The Lancet* as

“potentially the most important medical advance of this [the twentieth] century”

These gains in knowledge often led to synchronized declines in mortality across sets of countries that were at different stages of economic development.

The knowledge-driven model of health improvement provides a natural explanation for the temporal covariation between income and health: growth in health knowledge had its source in the same scientific revolution, and the attitude of experimentation originating in the Enlightenment, that brought forth new technology for producing output. Like two rockslides triggered by the footsteps of the same careless mountaineer, these two intellectual juggernauts proceeded in parallel to reshape the human condition. Of course, there were important intellectual links between the development of health-producing technology and the development of output-producing technology, so the description of them as parallel landslides is something of a caricature of Deaton's narrative. Still, my own feeling is that Deaton understates the role of economic growth and increased income in producing the health knowledge that was so instrumental in saving lives. Indeed, to the extent that he stresses income's role in producing that knowledge, it is on the demand side: industrialization brought about infection-prone agglomerations of people, which made discovery of the means to fight disease all the more important. But economists who study technological progress more broadly would emphasize two other channels by which income growth produced health knowledge: by producing better scientific tools, and by raising the willingness to pay for health discoveries. Both of these channels are exemplified in the discovery of sulfonamide antimicrobial agents in the 1930s. Though soon overshadowed by antibiotics such as penicillin, “sulfa drugs” were an enormous advance, giving

doctors their first effective treatment for many bacterial infections. Jayachandran, Lleras-Muney, and Smith (2009) estimate that these drugs raised life expectancy in the United States by between 0.4 and 0.8 years over the period 1937–43. Scientifically, sulfa drugs were spun off from the dye industry, based on synthetic chemicals derived from coal tar. The drug development looked much like R&D as described by modern growth theorists: an industrialized invention process undertaken by a profit-maximizing firm looking to use both secrecy and patents to reap monopoly profits (Lesch 2007). (Unfortunately for I.G. Farben, the company that did the drug development, it turned out that the active component in sulfa drugs was a molecule whose patent, issued in 1909, had already expired.) Examples like this suggest that without ongoing economic growth, the growth of health knowledge would have stalled out at some point in time.

The knowledge-driven model of health improvement provides a natural explanation for the upward shifts of the Preston curve, especially in the second half of the twentieth century, when the infrastructure for spreading medical advances worldwide was firmly in place. The converse of this observation is that knowledge, at least in its pure form, is not a good candidate for explaining cross-country differences in health outcomes today. Premature death in poor countries is largely attributable to the same set of diseases that were responsible for most of the premature death several centuries ago in today's rich countries. There are exceptions to this rule, the most notable being malaria (a mostly tropical disease) and HIV (a new disease). But the old-time killers—diarrhea, lower respiratory infections, tuberculosis, and conditions arising shortly after birth—still do a large share of the grisly work. The knowledge of how to defeat these conditions is widely available, at least in the sense that even in the poorest country, there are some

professionals who know what needs to be done. The germ theory of disease does not have to be rediscovered.

If knowledge does not explain the cross-country relationship between income and health, what does? It would certainly be possible for the upward shift in the Preston curve to be the result of worldwide advance of knowledge, while at the same time the cross-sectional income–health relationship was still due to causality from income to health. Once again, however, Deaton puts little stock in this story. The most important piece of evidence against this view is the observation that many of the health improvements that could save lives in poor countries are not very expensive. This is made particularly clear from close examination of episodes of rapid health improvement. Caldwell (1986) studied “mortality breakthroughs,” for example Sri Lanka over the period 1946 to 1953, where life expectancy rose by twelve years. His conclusion was that such episodes are more a matter of political and social will to address health issues than of the availability of economic resources. Along these lines, Cutler, Deaton, and Lleras-Muney (2006) point out that almost all of China’s remarkable improvement in infant mortality took place before economic growth took off in 1980, and similarly that the acceleration in growth in India following economic reforms in the early 1990s was accompanied by a slowdown in the rate of decline in infant mortality. Similarly, in Bolivia, Honduras, and Nicaragua, gains in life expectancy on the order of twenty years took place during periods of modest or even negative income growth (Soares 2007).

The most important negative health shock of our time, HIV, also suggests a relatively small role for income’s effect on health. The spread of HIV starting in the 1980s knocked as many as fifteen years off life expectancy in several sub-Saharan African countries, with some of that damage being subsequently

undone by behavioral change and the advent of antiretroviral therapy. But it is hard to see differences in income per capita as having played a large role in determining which African countries were most afflicted by the scourge. Botswana, long the economic success story of the region but with a quarter of adults infected with HIV, is a case in point. Finally, the United States, with its bloated health spending and mediocre average outcomes, provides yet another piece of evidence that more money does not always buy better health.

If causality from income to health does not explain cross-country differences in health, and if the pure knowledge story does not explain it either (in the sense that sufficient knowledge to drastically reduce mortality exists even in very poor countries), we are left with the question of what *does* explain mortality gaps. Deaton’s answer is that the source of variation is in the *application* of knowledge—in particular through government actions. Many of the important components of health improvement are public goods: “Turning the germ theory into safe water and sanitation takes time and requires both money and state capacity; these were not always available a century ago, and in many parts of the world they are not available today” (p. 97).

A final question to be addressed regarding causal links from income to health is the importance of this channel in explaining the correlation of these two variables *within* countries. Institutions are not a great candidate to explain this relationship, since to some extent these are the same for all citizens in a country (only to some extent, of course—the quality of institutions to which an individual has access can vary according to income, ethnicity, or location.) Similarly, knowledge in its pure form should be equally available to everyone in a country. Deaton’s answer again focuses on the application of knowledge, in this case by individuals.

Education is a key determinant of health because it allows individuals to apply knowledge in their own lives (and also allows them to know what government could be doing for them). This effect is easiest to see when new pieces of knowledge become available, and then are differentially taken up. For example, in the late nineteenth century, prior to the widespread acceptance of the germ theory of disease, the children of doctors and teachers had only slightly lower mortality rates than average. By 1925, when knowledge about how to control infection was available to be applied, such children had mortality rates that were one-third below average (Preston and Haines 1991). Similarly, at the time of the Surgeon General's report in 1964, there was little variation in rates of smoking by education; by 1987, smoking among male college graduates had fallen to 17 percent, as compared to 41 percent among high school dropouts (Preston 1996). The same type of human capital that unlocks access to health knowledge is also rewarded in the labor market, and this omitted variable induces a good deal of the correlation between health and income. (Although, obviously there is also a structural effect of income on health outcomes, via both nutrition and access to medical care, which is particularly important in poor countries.)

Deaton's conclusion is that the "diseases of poverty" that are the main killers in today's poor countries are overwhelmingly not caused by poverty. As a corollary, the best way to reduce the burden of these diseases is not to try to eliminate poverty, but to focus on health directly. And yet, for all the evidence that he provides about the income not being too important for health, Deaton does not take the view that income doesn't matter at all. "Income *must* be important in some ways and at some times. . . . Income is important in places where improving health requires better nutrition—for which people need money—or cleaner water and better

sanitation—for which governments need money" (p. 32).

As *The Great Escape* is not a quantitative monograph, Deaton does not need to take a stand on the precise magnitude of the effect of income on health, in other words, the value of the parameter α in equation (1). Further, he would probably (and correctly) say that the effect of income in health varies with both the institutional setting and the state of technology. For example, new medical technologies are often expensive, so in a period when such technologies are coming on line, the structural effect of income on health might be temporarily large. Indeed, the process of new cures starting as luxury goods before moving down market (examples are variolation for smallpox in the eighteenth century and antiretroviral drugs for HIV recently) is part of the story of escape and catch-up that characterizes the dynamics of both income and health. And finally, there is good reason to think that the structural effect of income on health varies with the level of income itself: among the very poor, increases in income facilitate the type of consumption that is health-improving; in rich countries, this is probably not the case. Summarizing all these effects in a single structural parameter would be contrary to the approach of the book.

4. *The Effect of Health on Income*

While Deaton takes seriously the idea that income affects health, he pays little attention to possibility that causality also runs from health to income. It is not clear whether this is because he thinks that the effect is small, or because his primary interest is in what determines health rather than in what determines income.

An extensive literature examines the effect of health on *individual* economic outcomes, with good reason. Not only is this an important question in its own right, with

implications for policy and welfare, but it is also a question for which it is possible to find good identifying variation. Exogenous differences among individuals or changes over time in specific health inputs can be matched to outcomes such as wages or education to produce well identified estimates. Examples of this approach include Behrman and Rosenzweig (2004), who use variations in birthweight among identical twins to identify the effect of fetal nutrition on education and wages among adults; Almond (2006), who shows that individuals exposed to Spanish Influenza in utero had lower education attainment and higher rates of disability than surrounding cohorts; and Bleakley (2007), who uses geographic variation in hookworm prevalence, combined with rapid eradication in the American South, to show a long-run effect of exposure to the parasite during childhood on education and wages. These and other studies create the presumption that a country that is in aggregate healthier should, *ceteris paribus*, be richer. Thus, the parameter β in equation (2) should be greater than zero. But microeconomic studies, because they only look at one aspect of health at a time, give little insight into just how large β should be when the indicator of health in equation (2) is a summary measure, such as life expectancy.

A leading proponent of the view that there is a large structural effect of health on income is Jeffrey Sachs. For example, in Sachs (2001) he writes: “Improving the health and longevity of the poor is an end in itself, a fundamental goal of economic development. But it is also a means to achieving the other development goals relating to poverty reduction. The linkages of health to poverty reduction and to long-term economic growth are powerful, much stronger than is generally understood. The burden of disease in some low-income regions, especially sub-Saharan Africa, stands as a stark barrier to economic growth and therefore must be addressed

frontally and centrally in any comprehensive development strategy.” Fogel (1997), examining the historical evolution of body size and calorie consumption in the United Kingdom, concludes that over the period 1780–1980, better nutrition raised labor input per work-aged adult by a factor of 1.96.

Empirical attempts to measure the aggregate effect of health on income are rare, in part because of the difficulty of achieving identification. The most important macro-level paper addressing this issue is Acemoglu and Johnson (2007), who use cross-country variation in the exogenous component of increased life expectancy during the international epidemiological transition to instrument for health improvements. In their analysis, the effect of health on income is *negative*—that is, countries that experienced larger exogenous health improvements saw lower gains in income per capita. Acemoglu and Johnson attribute their finding to two factors: first, the underlying effect of health on individual productivity is small; and second, improvements in health resulted in large increases in population, the effects of which undid any positive effect of productivity on income per capita.³ Similarly, Ahuja, Wendell, and Werker (2007) find no evidence of a negative effect of the HIV health shock on average income in Africa, using circumcision as an instrument.

My own work (Weil 2007) assesses the importance of aggregate health improvements by building up from well-identified microeconomic estimates of the effects of health improvements on productivity. Unlike Acemoglu and Johnson, I find that the effect of health is positive, but small. For example, translating the estimates into the units used in the discussion of the Preston curve above, a health improvement that raised life expectancy by five years would raise

³See Ashraf, Lester, and Weil (2009) for an evaluation of this channel.

labor productivity by 3.6 percent and output per capita in the steady state by the same amount. Recall that along the Preston curve in 2010, an increase in life expectancy of five years is associated with a doubling of output per capita.

Ashraf, Lester, and Weil (2009) go beyond the static analysis of Weil (2007) to examine the dynamic effect of health shocks. Their simulation model allows not only for direct effect of health on productivity, but also for several other channels, including the effect of better health on human capital investment, the change in population growth triggered by increased survival (stressed by Acemoglu and Johnson), and the negative response of fertility to increased child survival. The effect that they find is again relatively modest: an increase in life expectancy from forty to sixty years would raise GDP per capita in the long run by only 15 percent, and for the first thirty years after such an increase, output per capita would be lower than if health had not improved. In the context of the two-equation model presented above, these results imply that causation from health to income could not be driving much of the observed cross-country correlation between the two variables.

5. *Common Determinants of Health and Income*

If the structural effects of income on health (α in equation 1) and of health on income (β in equation 2) are both small, then the observed correlation between health and income must result from the errors in these two equations being highly correlated. This is hardly a radical idea. The first error term (μ) contains everything other than income that affects health, while the second (ϵ) contains everything other than health that affects income. Not only is that, in both cases, a lot of things, but there are many of them that we would expect to enter both equations. Among these omitted variables, one could

list institutions, geography, history, and so on. With so many common elements, we might not be surprised that the error terms are so highly correlated.

However, there is an additional constraint imposed by Deaton's theory. Consider a set of factors, X , that affect both error terms, and for simplicity let these effects be additive and linear. The equations for the two error terms are then

$$(3) \quad \epsilon_i = \sum_j \gamma_j X_{i,j}$$

$$(4) \quad \mu_i = \sum_j \delta_j X_{i,j}$$

The correlation between ϵ and μ will be determined by the variances and covariances of the X terms, as well as the two sets of parameters γ and δ . Roughly speaking, there are two possible situations under which ϵ and μ will be very highly correlated. The first possibility is that a single one of the X variables explains *most* of the variance in both ϵ and μ . In this case, it is easy to see why the two will then be correlated. The other possibility is that there are several X variables that contribute to the variances of both ϵ and μ , and that ratios of the parameters relevant to these variables in equation (3) and (4) are roughly equal, that is $\frac{\gamma_1}{\delta_1} \approx \frac{\gamma_2}{\delta_2} \approx \dots$.

While I can't bring any particular data to bear against the second theory, it strikes me as unlikely. What, other than coincidence, would explain two or more of the important omitted factors affecting health and income with the same ratio? By contrast, the first theory does not require any great coincidence. It only requires that a single factor be very important.⁴

⁴Of course, one can imagine alternative stories: for example, there might be one X variable that explains most of the variance in ϵ while a different X variable that explains most of the variation in μ , and these two X variables happen to be very highly correlated. But possibilities like this are not very plausible either.

The natural candidate for that factor is institutions, and indeed, the reader of Deaton's book will already have been primed to accept this view. In the case of health, much of his discussion of differences in health outcomes across countries, as well as improvements over time, is centered on government capacity. Government capacity shows up in many dimensions: in the ability to organize large public health projects such as clean water and sanitation; in the ability to effectively mount public information campaigns to encourage private health behaviors such as hand washing and condom use; in the regulation of harmful behavior such as smoking; in the provision of community-level health services; and in the ability to supervise private health providers. Though Deaton spends much less time discussing the determinants of income than those of health, when he does address the issue, he places institutions in the foreground. And of course, the argument that institutions are the dominant determinant of income has recently been forcefully laid out by Acemoglu and Robinson (2012) in their recent book.

This institution-centric view of the world finds expression in a number of other places in *The Great Escape*. It is present most forcefully in the final chapter, which discusses the effects of foreign aid on both economic growth in general and on health in particular. While Deaton allows that aid targeted at health outcomes has had good effects (though he thinks that raising it further would not), his view of aid targeted at achieving economic development can only be described as dismal. The recent vogue for project evaluation and randomized controlled trials does not impress him. External validity is a serious problem, in his view, along with the general equilibrium effects on prices that arise when small, successful projects are scaled up. Similarly, there is the problem of successful projects diverting resources and undercutting services that

governments provide. Finally, there is "the irritating but frequently encountered problem that projects do much better as experiments than when rolled out for real" (p. 292). More significantly, as currently conceived, aid is more likely to hurt than help institutional quality. Aid places a heavy burden on already stretched government resources. And, by eliminating the need to ask citizens for funds to carry out its activities, foreign aid eliminates the need for governments to obtain the consent or approval of those they rule, leading to long-run damage to the quality of institutions. "[L]arge inflows of foreign aid change local politics for the worse and undercut the institutions needed to foster long run growth" (p. 294).

More surprisingly, the institutional perspective also underlies much of the Deaton's discussion of measurement, a topic that suffuses the book. Recording data—births, deaths, treatments applied, and so on—requires much the same state capacity as delivering services. Thus, the same institutional characteristics that lead to better health and economic outcomes lead to better data by which these outcomes can be charted. Measurement is also a channel affecting outcomes: when things are measured, they become, politically and practically, easier to act upon. What is counted is a good indicator of how political power is distributed. It is no coincidence that the fifty years over which the U.S. government has made no adjustment to its poverty measure (beyond indexing to inflation) correspond to a period in which the political importance of the poor and near poor has been declining.

The insight that measurement is a useful indicator of institutional quality and an input into institutional change gives Deaton's book a pleasing unity. It is like a mystery story in which we discover at the end that the seemingly detached narrator—in this case, the available data—has in fact played a major part in the underlying action.

6. Conclusion

In *Leviathan*, Thomas Hobbes characterized the life of man in the state of nature as “nasty, brutish, and short.” The fact that so many of us can now lead lives that are both long and suffused with material comfort is a blessing of which we should be ever mindful. And the fact that so many people in the world today still cannot lead lives like this raises a puzzle deserving of our best intellectual efforts.

The most compelling questions addressed in Angus Deaton's book are about health: Why are poor people—both poor people who live in rich countries and almost everyone who lives in poor countries—so much more likely to die than rich people? And, what do the gaps in health have to do with gaps in income?

The idea that the answer to these questions might simply be “because higher income makes people healthier” hangs over much of *The Great Escape*. Deaton devotes much of his considerable intellectual firepower to demonstrating—convincingly, in my view—that this is not the case. While income surely has some effect on health outcomes via nutrition, access to medical care, and the ability of governments to afford public health spending, the salient fact is that there are many health improvements that could be made that are very cheap.

If causation running from income to health is modest, and if the same is true of causation running in the other direction (though Deaton pays much less attention to this second channel), then the observed correlation between health and wealth must be due to other factors. Which omitted variables are most important varies with the setting examined. The contemporaneous advance of income and health in the leading countries over the last several centuries (after millennia of stagnation) is explained largely by changes in knowledge. More specifically, productive

knowledge and health knowledge advanced together, driven by the underlying advance of science and the spirit of experimentation born of the Enlightenment. Among individuals within a country, the correlation between income and health is strongly influenced by human capital, which allows people to apply available health knowledge to their own lives, and also, of course, to earn more in the labor market.

The most compelling correlation between income and health is that observed in country averages, the so-called Preston curve. Whatever omitted factor drives this correlation must be extremely powerful, because the correlation is very high. The natural suspect, and the one that Deaton points to, is the quality of institutions. Applying available knowledge to stop people from dying from diarrhea and lower respiratory infections requires a government that is responsive and accountable to all of its people, and that has the capacity to achieve its goals. The same institutional characteristics that make countries good at producing output make them good at organizing clean water and access to medical care. Thus, having started in a very different place—with germs and malnutrition, rather than with parliaments and contracts—Deaton's book ends up making a powerful contribution to economists' evolving understanding of the importance of institutions. Though the former focused his attention on violence committed by men, and the latter on violence committed by microbes, Hobbes would approve of Deaton's conclusion that a well-functioning government is the actor that allows mankind to escape the state of misery.

REFERENCES

- Acemoglu, Daron, and Simon Johnson. 2007. “Disease and Development: The Effect of Life Expectancy on Economic Growth.” *Journal of Political Economy* 115 (6): 925–85.
- Acemoglu, Daron, and James A. Robinson. 2012. *Why Nations Fail: The Origins of Power, Prosperity, and*

- Poverty*. New York: Random House, Crown Business.
- Ahuja, Amrita, Brian Wendell, and Eric Werker. 2007. "Male Circumcision and AIDS: The Macroeconomic Impact of a Health Crisis." Harvard Business School Working Paper 07-025.
- Almond, Douglas. 2006. "Is the 1918 Influenza Pandemic Over? Long-Term Effects of *In Utero* Influenza Exposure in the Post-1940 U.S. Population." *Journal of Political Economy* 114 (4): 672–712.
- Ashraf, Quamrul H., Ashley Lester, and David N. Weil. 2009. "When Does Improving Health Raise GDP?" In *NBER Macroeconomics Annual 2008, Volume 23*, edited by Daron Acemoglu, Kenneth Rogoff, and Michael Woodford, 157–204. Chicago and London: University of Chicago Press.
- Behrman, Jere R., and Mark R. Rosenzweig. 2004. "Returns to Birthweight." *Review of Economics and Statistics* 86 (2): 586–601.
- Bleakley, Hoyt. 2007. "Disease and Development: Evidence from Hookworm Eradication in the American South." *Quarterly Journal of Economics* 122 (1): 73–117.
- Caldwell, John C. 1986. "Routes to Low Mortality in Poor Countries." *Population and Development Review* 12 (2): 171–220.
- Case, Anne, and Christina Paxson. 2010. "Causes and Consequences of Early-Life Health." *Demography* 47 (1 Supplement): S65–85.
- Cristia, Julian P. 2007. "The Empirical Relationship between Lifetime Earnings and Mortality." Congressional Budget Office Working Paper 2007-11.
- Cutler, David, Angus Deaton, and Adriana Lleras-Muney. 2006. "The Determinants of Mortality." *Journal of Economic Perspectives* 20 (3): 97–120.
- Cutler, David, and Grant Miller. 2005. "The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States." *Demography* 42 (1): 1–22.
- Deaton, Angus. 2006. "The Great Escape: A Review of Robert Fogel's *The Escape from Hunger and Premature Death, 1700–2100*." *Journal of Economic Literature* 44 (1): 106–14.
- Depetris-Chauvin, Emilio, and David N. Weil. 2013. "Malaria and Early African Development: Evidence from the Sickle Cell Trait." National Bureau of Economic Research Working Paper 19603.
- Gwatkin, Davidson R., Shea Rutstein, Kiersten Johnson, Eldaw Suliman, Adam Wagstaff, and Agbessi Amouzou. 2007. "Socio-economic Differences in Health, Nutrition, and Population within Developing Countries." World Bank Health, Nutrition, and Population Working Paper 48361.
- Jones, Charles I. 2002. "Sources of U.S. Economic Growth in a World of Ideas." *American Economic Review* 92 (1): 220–39.
- Floud, Roderick, Robert W. Fogel, Bernard Harris, and Sok Chul Hong. 2011. *The Changing Body: Health, Nutrition, and Human Development in the Western World since 1700*. Cambridge and New York: Cambridge University Press.
- Fogel, Robert William. 1997. "New Findings on Secular Trends in Nutrition and Mortality: Some Implications for Population Theory." In *Handbook of Population and Family Economics, Volume 1A*, edited by Mark R. Rosenzweig and Oded Stark, 433–81. Amsterdam and Boston: Elsevier, North-Holland.
- Jayachandran, Seema, Adriana Lleras-Muney, and Kimberly V. Smith. 2009. "Modern Medicine and the 20th Century Decline in Mortality: Evidence on the Impact of Sulfa Drugs." National Bureau of Economic Research Working Paper 15089.
- Lesch, John E. 2007. *The First Miracle Drugs: How the Sulfa Drugs Transformed Medicine*. Oxford and New York: Oxford University Press.
- Lucas, Robert E. 2000. "Some Macroeconomics for the 21st Century." *Journal of Economic Perspectives* 14 (1): 159–68.
- Oeppen, Jim, and James W. Vaupel. 2002. "Broken Limits to Life Expectancy." *Science* 296 (5570): 1029–31.
- Preston, Samuel H. 1975. "The Changing Relation between Mortality and Level of Economic Development." *Population Studies* 29 (2): 231–48.
- Preston, Samuel H. 1996. "American Longevity: Past, Present, and Future." Syracuse University Center for Policy Research Paper 36.
- Preston, Samuel H., and Michael R. Haines. 1991. *Fatal Years: Child Mortality in Late Nineteenth-Century America*. Princeton and Oxford: Princeton University Press.
- Sachs, Jeffrey D., ed. 2001. *Macroeconomics and Health: Investing in Health for Economic Development*. Geneva: World Health Organization.
- Soares, Rodrigo R. 2007. "On the Determinants of Mortality Reductions in the Developing World." *Population and Development Review* 33 (2): 247–87.
- Thomas, Duncan, and Elizabeth Frankenberg. 2002. "Health, Nutrition, and Prosperity: A Microeconomic Perspective." *Bulletin of the World Health Organization* 80 (2): 106–13.
- Vogl, Tom. 2012. "Height, Skills, and Labor Market Outcomes in Mexico." National Bureau of Economic Research Working Paper 18318.
- Weil, David N. 2007. "Accounting for the Effect of Health on Economic Growth." *Quarterly Journal of Economics* 122 (3): 1265–1306.
- Weil, David N. 2014. "Health and Economic Growth." In *Handbook of Economic Growth, Volume 2B*, edited by Philippe Aghion and Steven N. Durlauf, 623–82. Amsterdam and Boston: Elsevier, North-Holland.