

Notes

Introduction

- 1 The UN Human Development Report of 2005 is one recent example.
- 2 http://www.who.int/hpr/NPH/docs/declaration_almaata.pdf.
- 3 This theory is set out more clearly by, for example Sachs *et al.*, 2004.

1 Wealth, health and the cycle of progress

- 1 In this paper, I will use GDP per capita, per capita income, income, wealth and affluence interchangeably. All data pertaining to GDP will be in terms of constant International (PPP-adjusted) dollars. International dollars are obtained using a special conversion methodology utilizing “purchasing power parity” which is designed to reflect more accurately the purchasing powers of different currencies. Conversion is based on the number of units of a country’s currency required to buy the same amounts of goods and services in the domestic market as \$1 would buy in the United States. In contrast, the market exchange rate (MXR) of a currency in U.S. dollars is the amount of the currency one can buy with one U.S. dollar on the open currency market.
- 2 The logarithm of per capita income is used to moderate the impact on the index from additional increases in income.
- 3 Data on per capita food supplies and GDP per capita are from World Resources Institute (2005) and the World Bank (2005b), respectively. Income is given in constant (2000) PPP-adjusted International dollars.
- 4 The smoothed curves in this figure were generated by regressing FS against the logarithm of income based on the following “log-linear” relationship: $FS = A + B \cdot D + C \cdot \log(\text{income})$. D is a dummy variable to represent observations for different years ($D = 0$ for 1975, and 1 for 2002), and A, B and C are constant coefficients. A total of 263 observations were used for the two years (i.e., $N = 263$), the adjusted $R^2 = 0.65$, and the coefficients of the $\log(\text{income})$ term and the dummy variable are significant at the 99.9 per cent level (i.e., $p < 0.001$). In other words, the dependence of FS on GDP per capita is significant, as is the upward shift in this indicator as we go from 1975 to 2002.
- 5 Technology is defined here broadly to include tangible tools and machines as well as intangibles such as skills and knowledge (see Goklany 1995). It includes hardware, software, as well as management practices, competence and know-how. Over time, all these aspects of technology can be, and generally are, improved, perfected and diffused, that is, time is a surrogate for technological change (so defined). Thus the entire upward displacement is attributable to the passage of time.

- 6 The smoothed curves for 1990 and 2002, based on data from World Bank (2005b), were generated using log-log regression analysis, that is, by regressing the logarithm of ASW against $\log(\text{income})$ and a dummy variable to distinguish 1990 data from 2002 data. $N = 241$ for both years (combined). Because ASW cannot exceed 100 per cent, and some countries had reached that limit, a Tobit regression was used with truncation at this upper limit. The untruncated log-log regression had an adjusted $R^2 = 0.52$. The coefficients for the dummy variable and the $\log(\text{income})$ terms, that is, the upward displacement of the ASW curve with time and the increase of ASW with income, are significant at the 95 per cent level for both the truncated and untruncated regressions.
- 7 See Table 1 and Figure 2.
- 8 See Table 3.
- 9 This figure, constructed using data from World Bank (2005b), uses the same methodology as is used for Figure 2 for food supplies per capita. See footnote 14. The smoothed curves in this figure are based on log-linear regression analysis. $N = 268$ for 1977 and 2003 cumulatively; adjusted $R^2 = 0.56$. The increase in life expectancy due to increase in income and the passage of time are both significant at the 99.9 per cent level.
- 10 And references therein. See Abstract and pp 13–15.
- 11 Health adjusted life expectancy is the life expectancy adjusted downward to account for the degradation in the quality of life due to ill health. It is calculated by subtracting a portion of years of ill-health (weighted according to severity) from the expected (unadjusted) life expectancy to give the equivalent years of healthy life.
- 12 Figure 5 uses data from WRI (2005) for 1950–55 and 1955–60 (plotted as 1952.5, and 1957.5, respectively). For Russia, it plotted the WRI data for 1960–65 and 1965–70 as 1962 and 1967 data. The multiple years reflect five-year averages. The rest of the data are from World Bank (2005b).
- 13 See, e.g., Pritchett and Summers (1996); World Bank (1993).
- 14 The curves in Figure 6 were fitted using a log-log relationship. $N = 271$ and adjusted $R^2 = 0.77$ with a dummy variable to distinguish data for the different years. The lowering of the curve over time is consistent with the creation and diffusion of new and existing-but-underused technologies. Both the lowering of the infant mortality with time and with the level of GDP per capita are significant at the 99.9 per cent level.
- 15 Figure 8 is based on data from 1990 and 2002 from World Bank (2005b) using log-log regression with a dummy variable to account for the data from the different years. The cumulative $N = 180$, and the adjusted $R^2 = 0.58$. The shift in the curve from 1990 to 2002 and the dependence of post-secondary enrolment on income levels are significant at the 99.9 per cent level and are probably owing to increasing knowledge about the benefits of education and the willingness and ability of families and societies to incur the costs of longer periods of education.
- 16 As noted previously, the index uses the logarithm of GDP per capita.
- 17 GDP per capita trends are based on constant, PPP-adjusted International dollars (World Bank 2005b).

- 18 The decline in their GDP per capita was largely due to a drop in the price of oil during this period.
- 19 The following data sources were used: for life expectancy, Haines (1994) for 1850–1900, Bureau of the Census (1975) for 1900–1970, Bureau of the Census (various years) for 1971–1979, CDC (2004) for 1980–2002; for literacy, Costa and Steckel (1997), and Bureau of the Census (1975) for 1900–1970; for GDP per capita (in constant 1990 International dollars), Maddison (2005a) for 1820 to 1990, and GGDC&CB (2005) for 1990–2002.
- 20 Figure 12, based on data from the World Bank (2005b), is constructed using linear regression for the smoothed curves, with a dummy variable to distinguish 1975 data from 2003 data. Cumulative $N = 258$, and adjusted $R^2 = 0.47$. The coefficients, which indicate that cereal yield increases with both time and economic development, are both significant at the 99.9 per cent level.
- 21 This is over and above their level of production and stocks at hand.
- 22 Bairoch defines manufacturing industry as industry in general except mining, construction, electricity, gas, and water.
- 23 This is calculated from GDPs provided by Maddison (2005a) for 1700 and 2001, and assumes a uniform (exponential) annual growth rate from 1700–1820 to calculate the GDP per capita for 1800.

2 South Africa's healthcare under threat

- 1 Republic of South Africa, South African Statistics 2004/05 (Pretoria: Statistics South Africa, 2005), p. 8.8, Table 8.3. Figures for private hospitals are dated June 2004 and those for semi-private and public hospitals August 2003. Mine hospitals are not included in the figures. According to Statistics South Africa there are 29 semi-private hospitals with 5 889 beds. For the purpose of this paper semi-private hospitals and beds have been included as public hospitals since they are “private” only in the sense that they are operated by private companies and charities under contract to government, with the bulk of funding from government. According to the Hospital Association of South Africa (HASA), which represents the majority of private hospitals in the country, there are 200 private hospitals with 26 000 private beds.
- 2 *Traditional medicine helps with Aids*, Mail and Guardian, 30 March 2004.
- 3 *Deadly Denial*, Time – Europe Edition: 19 April 2004, Volume 163, No 16. Also see: John Kane-Berman, *Beyond a Joke* (Johannesburg: South African Institute of Race Relations, Fast Facts No3 / March 2004.)
- 4 John Kane-Berman, *Beyond a Joke* (Johannesburg: South African Institute of Race Relations, Fast Facts No3/March 2004.)
- 5 Information on the contracts was posted on the company websites at the time of writing.
- 6 Anthony Browne, *NHS Cases pay for Quick Ops in South Africa* (London: The Observer, March 17, 2002.).
- 7 Thomas Sowell, *Tax cuts do what?* (New York: Opinion Journal – From the Wall Street Journal Editorial Page, 29 February 2004).

- 8 The author underwent MRI scans in 2000 and in 2005 and in both instances the procedures were done within hours after referral to the MRI facility by the doctor.
- 9 *Waiting your turn: Hospital Waiting Lists in Canada* (Vancouver, B.C: Fraser Institute: 2004), p.4.
- 10 James Bartholomew, *Six months wait for an MRI scan*. (April 19, 2005) Retrieved: August 22, 2005 from http://www.thewelfarestatewerein.com/archives/2005/04/six_months_wait.php. Also see: Nigel Hawkes, *Go private or wait 80 weeks, patient told* (London: The Times Online, 18 June 2005). Retrieved: August 22, 2005 from <http://www.timesonline.co.uk/article/0,,2-1659149,00.html>.
- 11 *Manto concerned about high cost of health care* (Johannesburg: Mail and Guardian, July 11, 2005.).
- 12 Treatment Action Campaign, *Minister Must Commit to Purchasing Interim Supply of Antiretroviral Medicines to Avoid Court Case*. Treatment Action Campaign Newsletter, 16 March 2004.
- 13 Republic of South Africa, *South African Yearbook 2003/04* (Pretoria: Government Communications: 2003), p. 374.
- 14 On the view that the introduction of new health-care technology is an obstacle to providing universal care and should be limited to make health care available to all see: National Department of Health, *Inquiry into the various Social Security Aspects of the South African Health System* (Pretoria: National Department of Health, May 2002.), p. 42.

3 Corruption in public health

- 1 When all three governance measures are jointly regressed on infant mortality and per cent measles immunization, only government commitment and is significant and consistently shows the expected sign.
- 2 Low demand for immunization occurs in developed countries as well, which accounts for the legal requirement in the US that children must be immunized before they enter day care or school. In the rest of the OECD governments take responsibility for ensuring immunization coverage.
- 3 It is counter-intuitive that only 15% of the Indian public and 9% of the Kazak public perceive corruption in the health sector when they ranked it so highly on perceptions of corruption in the sector. This bears further investigation.
- 4 They found that 26% of positions and 41% of physicians slots were vacant, suggesting that the total available stock was already below what was demographically required and budgeted.
- 5 The Bolivia survey collected data from 2888 women in 106 municipalities; the Moldova survey consisted of 390 interviews with physicians, nurses and patients in the capital, Chisinau, and two provinces; the Albanian household survey surveyed 3 provinces; the Poland survey was only of Gdansk and Wroclaw cities; and, the Kazakh hospital survey interviewed 1508 discharged patients from three Almaty City hospitals.

4 The diseases of poverty and the 10/90 gap

- 1 Available at <http://www.who.int/intellectualproperty/documents/thereport/en/index.html>
- 2 Accessed at: <http://www.aeras.org/>
- 3 Accessed at: http://idri.org/page.php?pg_page_id=1
- 4 Drugs in development by the following PPPs: Bio Ventures for Global Health, Pharmaprojects, MMV, GATB, DNDi.
- 5 *Ibid.*
- 6 <http://www.who.int/mediacentre/factsheets/fs117/en/>
- 7 <http://www.who.int/vaccines/en/pertussis.shtml>
- 8 <http://www.who.int/mediacentre/factsheets/fs101/en/>
- 9 Victora CG., et al., *Applying an equity lens to child health and mortality: more of the same is not enough*, *Lancet*, 2003; 362: 233–41
- 10 The study assessed the size and impact of tariffs and taxes on drugs imported from the EU; taxes and tariffs on drugs imported from elsewhere may be subject to different rates of taxes and tariffs.
- 11 Poor countries are not members of the WTO Pharmaceutical Agreement, a 22 member agreement, concluded during the Uruguay Round, which has led to the reciprocal elimination of tariffs (dubbed 'zero-for-zero') on approximately 7,000 products (European Commission, 2003 and 2002).
- 12 The East African Community (EAC) is the regional intergovernmental organisation of the Republics of Kenya, Uganda and the United Republic of Tanzania with its headquarters in Arusha, Tanzania. The EAC website is: <http://www.eac.int/>
- 13 Information regarding the EAC Customs Union Tariffs scheme can be accessed at: http://www.eac.int/EAC_customs_U.htm
- 14 <http://allafrica.com/stories/200502230903.html>
- 15 European Commission, 2003. Applied customs rates were found for each of 27 HS numbers. To obtain an average customs rate per country, these numbers were arithmetically added without weighting them. The same process was used to calculate the average rates of VAT and other duties.

5 Increasing access to medicines

- 1 Alternate Solutions Institute, Pakistan.
- 2 Imani, Ghana.
- 3 Free Market Foundation, South Africa.
- 4 Global Biosciences Development Institute, USA.
- 5 ESEADE University, Argentina.
- 6 Instituto Libertad y Progreso, Colombia.
- 7 Liberty Institute, India.
- 8 Minimal Government, Manila, Philippines.
- 9 Fundación Atlas 1853, Argentina.
- 10 International Policy Network, UK.
- 11 Instituto Libre Empresa, Peru.
- 12 Instituto Liberdade, Brazil.

- 13 Africa Fighting Malaria, South Africa.
- 14 Jabu Mhlabane. Nearly 50 Mpumalanga doctors implicated in medicine theft (Middelburg, South Africa: *African Eye News Service*, 13 February 2003). (Published on the website of *LowveldInfo.com*).
- 15 The study assessed the size and impact of tariffs and taxes on drugs imported from the EU; taxes and tariffs on drugs imported from elsewhere may be subject to different rates of taxes and tariffs.
- 16 Poor countries are not members of the WTO Pharmaceutical Agreement, a 22 member agreement, concluded during the Uruguay Round, which has led to the reciprocal elimination of tariffs (dubbed 'zero-for-zero') on approximately 7,000 products (European Commission, 2003 and 2002).
- 17 The East African Community (EAC) is the regional intergovernmental organisation of the Republics of Kenya, Uganda and the United Republic of Tanzania with its headquarters in Arusha, Tanzania. The EAC website is: <http://www.eac.int/>
- 18 Information regarding the EAC Customs Union Tariffs scheme can be accessed at: http://www.eac.int/EAC_customs_U.htm
- 19 <http://allafrica.com/stories/200502230903.html>
- 20 European Commission, 2003. Applied customs rates were found for each of 27 HS numbers. To obtain and average customs rate per country, these numbers were arithmetically added without weighting them. The same process was used to calculate the average rates of VAT and other duties.
- 21 While there are some countries where the costs of introducing a patent system may temporarily outweigh the benefits, this applies only to those countries without a substantial knowledge-based industry. For those countries with incipient or extant knowledge-based industries, such as India, China, Brazil and South Africa, the benefits of introducing a patent system will quickly outweigh the costs.
- 22 McArthur (1999) shows that in industries with relatively stringent protection for intellectual property, capital spending is higher, the demand for high quality goods for export and the ratio of skilled to unskilled workers both increase over time. Those same incentives that exist for investment in industries that do enjoy relatively high levels of intellectual property protection tend not to exist when that protection does not exist or is abandoned. McArthur, W. M.D., *Intellectual Property Rights and the Pharmaceutical Industry*, The Fraser Institute, 1999, pp. 85–104.
- 23 SCRIIP data.
- 24 http://www.businessweek.com/magazine/content/05_16/b3929068.htm
- 25 http://www.advocate.com/news_detail_ektid19293.asp
- 26 http://www.sedb.com/edbcorp/sg/en_uk/index/in_the_news/press_releases/2004/singapore_s_biomedical.html
- 27 <http://drugresearcher.com/news/printNewsBis.asp?id=57722>
- 28 http://www.rbm.who.int/cmc_upload/0/000/015/364/RBMInfosheet_9.htm
- 29 Or alternatively: novelty, inventive step and industrial application.
- 30 In the context of the debates over patents on genetic sequences and research tools, if some countries allow patents and others don't, then – other things being equal – over time it will become clear which countries are more conducive

- to high-levels of research and development into down-stream innovations. Of course not all other things are equal, but to the extent that this competition is already taking place, the winner seems to be the country with the broader patent system: the United States. Time will tell.
- 31 Common practice for the Food and Drug Administration in the United States is 5 years, which is also the period agreed upon in many of the bilateral free trade agreements it has recently signed.
 - 32 Potential cost savings for companies relying on data would be in the order of \$450 million, the average costs associated with clinical trials for each approved drug. Some estimates show that these costs have more than tripled in the past fifteen years.
 - 33 When data exclusivity is weak, it can also drive research-based pharmaceutical research industries out, as has happened in the past few years in Israel. A once thriving research destination, the lack of data exclusivity – the result of a powerful generics lobby – had driven research elsewhere. In September 2005, the legislation was changed to provide some data protection.
 - 34 In legal terms, the specific element that is crucial to the firm's ability to price differentiate within a market is the international patent exhaustion principle. If patent rights are exhaustible the patentee must renounce the right to its product the moment it is first sold, giving the first purchaser the ability to potentially resell at a higher price. The TRIPS agreement does little to clear up this pressing issue. (http://www.wto.org/english/tratop_e/trips_e/factsheet_pharm02_e.htm)
 - 35 A good example of successful price discrimination without re-exportation comes from the example of bronchodilators in South Africa. Here, Government purchases accounted for 66 per cent of sales volume, but only 33 per cent of revenues. In this case patents show that, if parallel importation is controlled for, good health can be promoted. Reekie, W.D., "South Africa's Battle with AIDS and Drug Prices", National Center for Policy Analysis, Dallas, TX, Brief 334, 2000.
 - 36 <http://www.freemarketfoundation.com/ShowArticle.asp?ArticleType=Publication&ArticleID=1093>
 - 37 The most recent example comes from Brazil, where the head of the country's AIDS program cited an increasingly high percentage of its AIDS budget, which is designed to offer Brazilians with the disease (some 600,000) free treatment, had to be devoted to pharmaceutical purchases. Because of this, Brazil threatened to issue compulsory licenses on the key drugs that combine to form anti-retro viral treatments. <http://news.bbc.co.uk/1/hi/health/4059147.stm>, accessed 06/01/2005
 - 38 'Neglected diseases' are defined by the WHO as African Trypanosomiasis, leishmaniasis and Chagas disease.

6 Cost effective means of fighting the diseases of poverty

- 1 Alternate Solutions Institute, Pakistan.
- 2 Imani, Ghana.
- 3 Free Market Foundation, South Africa.
- 4 Global Biosciences Development Institute, USA.

- 5 ESEADE University, Argentina.
- 6 Instituto Libertad y Progreso, Colombia.
- 7 Liberty Institute, India.
- 8 Minimal Government, Manila, Philippines.
- 9 Fundación Atlas 1853, Argentina.
- 10 International Policy Network, UK.
- 11 Instituto Libre Empresa, Peru.
- 12 Instituto Liberdade, Brazil.
- 13 Africa Fighting Malaria, South Africa.
- 14 http://www.who.int/hiv/AAI_fs_4Q2005.pdf
- 15 United States Leadership Against HIV/AIDS, Tuberculosis, and Malaria Act of 2003.
- 16 <http://online.wsj.com/article/0,,SB111644800426237250,00.html>
- 17 WHO/CDS/WHOPES/GCDPP/2004.6, A generic risk assessment model for insecticide treatment and subsequent use of mosquito nets.
- 18 http://www.cdc.gov/malaria/control_prevention/vector_control.htm
- 19 <http://www.rotavirusvaccine.org/vaccine-facts.htm>

7 Counterfeit medicines in LDCs: problems and solutions

- 1 <http://www.who.int/mediacentre/factsheets/fs275/en/>
- 2 Liza Gibson, "Drug regulators study global treaty to tackle counterfeit drugs," *British Medical Journal* Volume 328, Number 486 February 28, 2004.
- 3 European Federation of Pharmaceutical Industries and Associations, "Counterfeit medicines", available at http://www.efpia.org/2_indust/counterfeitdrugs.pdf
- 4 <http://www.manilatimes.net/national/2005/aug/16/yehey/life/20050816lif1.html>
- 5 <http://bmj.bmjournals.com/cgi/content/full/327/7424/1126-a>
- 6 Fackler M (2002 July 29) China's fake drugs kill thousands. *San Francisco Examiner*
- 7 <http://www.who.int/entity/bulletin/volumes/81/12/WHONews.pdf>
- 8 <http://bmj.bmjournals.com/cgi/content/full/327/7412/414-b>
- 9 http://pharmalicensing.com/articles/dispatch/1120475327_42c918bf09048
- 10 Selling cheap generic drugs, India's copycats irk industry, available at <http://chakra.org/articles/2000/12/03/indian/drugs>
- 11 Latin America Battles Counterfeit Drug Threat, *Daily International Pharmacy Alert: Washington Business Information*, 2(292), 2006.
- 12 http://www.efpia.org/2_indust/counterfeitdrugs.pdf
- 13 Fake drugs worry authorities, firms, *The Russia Journal*, 2000, 3(4) 47
- 14 *South China Business Journal*, June/July/August, 2002.
- 15 <http://www.prospect.org/web/page.wv?section=root&name=ViewWeb&articleId=10650>
- 16 <http://www.freemarketfoundation.com/ShowArticle.asp?ArticleType=Publication&ArticleID=1093>
- 17 Very often, the supply of drugs is reduced by the Byzantine and tortuous regulations that emanate from local drug approval agencies. These regulations make it very difficult for manufacturers wishing to export to overseas markets

to register new products, thereby creating a gap in supply. This gap provides another opportunity for counterfeiters. One example is South Africa's Medical Control Council, which requires that all new medicines attain its own regulatory approval before they can be marketed in the country – even if they have already been approved by reputable foreign regulatory bodies such as the FDA. However, the extreme inefficiency of the FDA means that drugs that have already been registered for use in the US, EU and Japan wait an average of 39 months for approval in the South African system. If such delays occur on already existing medicines, it presents a clear incentive to counterfeiters to meet the artificially pent up demand in the market.

- 18 These artificial price inflators can price many patients out of treatment, and give them an incentive to look to cheaper counterfeit medicines to meet their needs. Abolishing these levies would return medicines to their natural prices, thereby undermining the potential profits – and incentives – of counterfeiters.

8 The value of vaccination

- 1 The authors thank Roger Glass, Tore Godal, Yuki Murakami, Sreekanth Ramachandra, Larry Rosenberg, and Josh Salomon for their assistance and comments. Financial assistance from the Global Alliance for Vaccination and Immunization is greatly appreciated. Earlier versions of this article were presented at the Sixth International Rotavirus Symposium in Mexico City (June 2004), a GAVI-funded seminar on “Development and Deployment of Vaccines Against Poverty-Related Diseases” in Bergen, Norway (September 2004), and the 23rd annual meeting of the European Society for Paediatric Infectious Diseases in Valencia, Spain (May 2005).
- 2 A notable sidelight to this story is that GlaxoSmithKline has now developed Rotarix, a new rotavirus vaccine (which does not appear to have intussusception as a side effect), which has already been introduced in Mexico and will soon be introduced in other developing countries. See *Technology Review*, June 2005, available at http://www.technologyreview.com/articles/05/06/tri_tri_vaccine.asp?p=1.
- 3 <http://www4.nas.edu/news.nsf/6a3520dc2dbfc2ad85256ca8005c1381/e82b28891131e63e85256fab006fb1f3?OpenDocument>
- 4 See, for example, Coudeville L (1999): The value of varicella vaccination in healthy children: cost-benefit analysis of the situation in France. *Vaccine* 1999 Jan 17:2 142–51; Ekwueme DU (2000) Economic evaluation of use of diphtheria, tetanus, and acellular pertussis vaccine or diphtheria, tetanus, and whole-cell pertussis vaccine in the United States, 1997. *Arch Pediatr Adolesc Med* 2000 Aug 154:8 797–803; Pelletier L (1998): A benefit-cost analysis of two-dose measles immunization in Canada. *Vaccine* 1998 May-Jun 16:9–10 989–96; Tormans HIV/AIDS (1998): Economic evaluation of pertussis prevention by whole-cell and acellular vaccine in Germany. *Eur J Pediatr* 1998 May 157:5 395–401; Hussain, I.H.M.I., Syed Aljunid, Sofiah, A., Ong, L.C., Choo, K.E., Musa, M.N., Teh, K.H. & Ng, H.P. (1999): Cost-Benefit Analysis Of Haemophilus Influenzae Vaccination Programme In Malaysia. *Buletin Kesihatan Masyarakat Jilid 5, 1999*; Ulla K

Griffiths, Lara J Wolfson, Arshad Quddus, Mohammed Younus, Rehan A Hafiz (2004): Incremental cost-effectiveness of supplementary immunization activities to prevent neonatal tetanus in Pakistan. *Bulletin of the World Health Organization*, September 2004, 82 (9); Uyl-de Groot CA, Vermorken JB, Hanna MG Jr, Verboom P, Groot MT, Bonsel GJ, Meijer CJ, Pinedo HM. (2005). Immunotherapy with autologous tumor cell-BCG vaccine in patients with colon cancer: a prospective study of medical and economic benefits. *Vaccine*. Vol.23(17–18):2379–87; Navas E, Salleras L, Gisbert R, Dominguez A, Timoner E, Ibanez D, Prat A. (2005). Cost-benefit and cost-effectiveness of the incorporation of the pneumococcal 7-valent conjugated vaccine in the routine vaccination schedule of Catalonia (Spain). *Vaccine*. Vol. 23(17–18):2342–8; McIntosh ED, Conway P, Willingham J, Hollingsworth R, Lloyd A. (2005). Pneumococcal pneumonia in the UK – how herd immunity affects the cost-effectiveness of 7-valent pneumococcal conjugate vaccine (PCV). *Vaccine*. Vol. 23(14):1739–45; Jean-Jasmin LM, Lynette SP, Stefan M, Kai CS, Chew FT, Wah LB. (2004). Economic burden of varicella in Singapore – a cost benefit estimate of implementation of a routine varicella vaccination. *Southeast Asian J Trop Med Public Health*. Vol. 35(3):693–6; Uzicanin A, Zhou F, Eggers R, Webb E, Strebel P. (2004). Economic analysis of the 1996–1997 mass measles immunization campaigns in South Africa. *Vaccine*. Vol. 22(25–26):3419–26; Shepard DS, Suaya JA, Halstead SB, Nathan MB, Gubler DJ, Mahoney RT, Wang DN, Meltzer MI. (2004). Cost-effectiveness of a pediatric dengue vaccine. *Vaccine*. Vol. 22(9–10):1275–80. Two studies in developed countries, on the other hand, showed that programs were not cost-effective: Allsup S, Haycox A, Regan M, Gosney M. (2004). Is influenza vaccination cost effective for healthy people between ages 65 and 74 years? A randomised controlled trial. *Vaccine*. Vol. 23(5):639–45; Melegaro A, Edmunds WJ. (2004). The 23-valent pneumococcal polysaccharide vaccine. Part II. A cost-effectiveness analysis for invasive disease in the elderly in England and Wales. *Eur J Epidemiol*. Vol. 19(4):365–75.

- 5 This approach assumes that health is a uni-dimensional variable that is reflected in mortality and morbidity measures. Both microeconomic and macroeconomic studies of the effect of health on labor productivity use this approach, which enables a single measure to be used as an indicator of an individual's or a community's health. In our study, the health improvements generated by vaccination are therefore taken to have economic impacts similar to those of health improvements on average.

9 The World Health Organisation: a time for reconstitution

- 1 This statement reflects the practicalities of the situation. As a purely conceptual matter, the liability for that added protection could be placed on either the residents of the poorer lands or the residents of the wealthier lands. The reciprocal nature of externality relationships is developed in Ronald H. Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (October 1960), 1–44.

- 2 Snow, B et al., "The global distribution of clinical episodes of *Plasmodium falciparum* malaria", *Nature* 434, 214–217 (10 March 2005)
- 3 For an emphasis on monetary contraction, see Milton Friedman and Anna J. Schwartz, *A Monetary History of the United States* (Princeton: Princeton University Press, 1963), esp. pp. 299–419. For an emphasis on credit expansion, see Murray Rothbard, *America's Great Depression* (Kansas City: Sheed Andrews, 1963). For an emphasis on regulation, see Robert J. Barro, "Second Thoughts on Keynesian Economics," *American Economic Review*, Proceedings, 69 (May 1979): 54–59.
- 4 Lecture in 1755, quoted by Dugald Stewart
- 5 On the positive relationship between freedom and wealth worldwide, see James Gwartney and Robert Lawson, *Economic Freedom of the World* (Vancouver: Fraser Institute, 2004).
- 6 For a sample of valuable work on this matter, see William Easterly, *The Illusive Quest for Growth* (New York: St. Martin's Press, 2001); Peter Bauer, *From Subsistence to Exchange* (Princeton: Princeton University Press, 2000); Peter J. Boettke, ed., *The Collapse of Development Planning* (New York: New York University Press, 1994); Deepak Lal, *The Poverty of Development Economics* (Cambridge: Harvard University Press, 1983); and Peter T. Bauer and Basil S. Yamey, *The Economics of Underdeveloped Countries* (Cambridge: Cambridge University Press, 1957).
- 7 For exemplary treatises on bureaucracy, see Gordon Tullock, *The Politics of Bureaucracy* (Washington: Public Affairs Press, 1965); William A. Niskanen, *Bureaucracy and Representative Government* (Chicago: Aldine, 1971); Anthony Downs, *Inside Bureaucracy* (Boston: Little, Brown, 1967); and Thomas E. Borcherding, ed. *Budgets and Bureaucrats* (Durham, NC: Duke University Press, 1977).