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## **Britain, China, and the Irrelevance of Stage Theories**

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Part 4 of 13  
“Britain, China, and the  
Irrelevance of Stage Theories”

(Table of contents and Chps. 8-10 from:)

*Bourgeois Dignity and Liberty:  
Why Economics  
Can't Explain  
the Modern World*

[Vol. 2 of The Bourgeois Era]

Deirdre N. McCloskey

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To Readers: The argument is, I fancy, complete, but some details in  
footnotes and references, and occasionally matters of routine calculation  
in the main body, need to be cleaned up.

**Abstract:** Britain was first, though the classical (and many of the neoclassical) economists did not recognize that it's course was beginning the factor of 16. The slow British growth in the 18<sup>th</sup> century proposed by Crafts and Harley is unbelievable, but however one assigns growth within the period 1700-1900 it is now plain that something unprecedented was happening. Only non-economists recognized it at the time. The central puzzle is why innovation did not fizzle out, as Mokyr has put it---as it had at other times and places. Productivity in cotton textiles, for example, grew at computer-industry rates, and continued to into the 20<sup>th</sup> century. But Europe's lead was not permanent. The California School of Pomeranz and Goldstone and Allen and others have shown that China led the West in 1500, and maybe as late as 1750, then fell dramatically behind. It was the *continuation* of European growth in the 19<sup>th</sup> and 20<sup>th</sup> centuries that is strange and new. Explaining the Great Divergence requires focusing on non-European events in the 19<sup>th</sup> century---not some deep-seated European cultural superiority. On the other hand, Europe's fragmented polity *was* an advantage, as shown in the swift uptake of the printing press. The way that non-European places like Japan or Botswana or India have been able to grow demonstrates that the stage theories popular in European thought from the 18<sup>th</sup> century to the present (for example, in modern growth theory) are mistaken. The metaphors of biological stages or human foot races are inapt, as in the business-school talk of "competitiveness" nowadays. The "rise" of non-European economies does not presage a "decline" or Europe or its offshoots, merely a borrowing of social and engineering technologies such as Europe once borrowed from elsewhere. The dignity and liberty of ordinary people stands in the middle of such "technologies."

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## Chapter 8:

### Britain Led

Britain was first, and so Britain is a good place to go hunting for answers.

The place also led in the study of economics – assisted by Spanish professors, Dutch merchants, French physicians, and Italian penologists – from the English political arithmeticians of the seventeenth century down through David Hume, Adam Smith, T. R. Malthus, David Ricardo, John Stuart Mill, and the British masters of the subject in the early twentieth century. The economy was conceived as separate from politics early in Britain (earlier still in Holland, and later in France, and much later in Germany), which is one bit of evidence that a bourgeois culture was emerging. Economics was for a long time a British and even disproportionately a Scottish subject. Only after the Second World War did it become, like many other fields of the intellect, dominantly American.

Oddly, the British economists around 1776 or 1817 or 1871 did not recognize the factor of sixteen as it was beginning to happen, and even now their heirs in America sometimes forget it. The theories of the economists took useful account of little changes – a 5 percent rise of income when cotton factories grew or a 10 percent fall when Napoleon ruled the Continent. But they did not notice that the change to be explained, 1780-1860, was not 5 or 10 percent but 100 percent, and was on its way

to that unprecedented 1,500 percent relative to what is was in the eighteenth century. Only recently, beginning in the 1950s, has the inquiry into the nature and causes of the wealth of nations begun to recognize the oversight.

In the 1940s Joseph Schumpeter was already scornful of the classical economists for their failure to see what was happening. T. R. Malthus (1766-1834) and David Ricardo (1772-1823) "lived at the threshold of the most spectacular economic development ever witnessed. . . . [yet] saw nothing but cramped economies, struggling with ever-decreasing success for their daily bread."<sup>1</sup> Their student John Stuart Mill (1806-1873) even in 1871 "had no idea of what the capitalist engine was going to achieve."

What Mill lacked, and Schumpeter and a handful of later economists such as the American Frank Knight possessed, was an appreciation of how Romantic motivations in a business-oriented civilization drove even the businessmen, and how creative such motivations were.<sup>2</sup> Knight observed acutely in 1923 that "economic activity is *at the same time* a means of want-satisfaction, an agency for want- and character-formation, a field of creative self-expression, and a competitive sport. While men are 'playing the game' of business, they are also molding their own and other personalities."<sup>3</sup> Schumpeter gave in 1926 a similarly sociologized analysis of why capitalists played the game, a step beyond the naïve assumption in Marx and Veblen and many more recent critics of the bourgeoisie that "endless

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<sup>1</sup> Schumpeter 1954, p. 571. "In the 1940s" because he died early in 1950; the book was published posthumously.

<sup>2</sup> Bronk 2009, p. 55.

<sup>3</sup> Knight 1923, p. 39, his italics.

accumulation" is the game. Accumulation, Schumpeter said, was for social status, not only for itself. "For itself" businesspeople "delight in ventures," "exercising one's energy and ingenuity." And the macho "will to conquer," "akin to sport," is motivating, too. Yes – though none of these is peculiarly modern, and only for the first, status-taking motive "is private property as the result of entrepreneurial activity an essential factor in making it operative."<sup>4</sup> At the funeral games of Hector, too, the men raced, exercising their energy and skill, and proudly won, and nobly lost.

\* \* \* \*

Restricting attention to what Mill could possibly have known, and what economic historians have been showing since the 1950s, British national income per head nearly doubled in the century down to 1870, even though population also more than doubled. Nicholas Crafts and C. Knick Harley, arguing for a very gradual onset of the Industrial Revolution, and a narrow industrial range for its innovations until the late nineteenth century, dispute the pattern that many other students of the matter claim to see.<sup>5</sup> The Two Nicks, as we affectionately call them, see the big changes as occurring after 1820 and especially after 1848.<sup>6</sup> And they give more weight to science than economic historians like Maxine Berg and Pat Hudson

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<sup>4</sup> Schumpeter 1926, p. 93f.

<sup>5</sup> Berg 1985; McCloskey 1991; Berg and Hudson 1994; Temin 1997, 2000.

<sup>6</sup> Harley 1982; Crafts and Harley 1992, 2004; Harley and Crafts 2000; Crafts 1985, 1994, 2004a, 2004b. Their views are similar to the very unpopular ones of Cameron 1994 and Cameron 1993, pp. 165-167.

and Peter Temin and Richard Sullivan and I would, who think that for a long time innovation came mainly from workshops, not from laboratories, and came in great volume in the form of new products that the conservative measures of national income capture poorly rather than from new scientific processes, which they capture better. Big industries like brewing were revolutionized in the eighteenth century, as the economic historian Peter Mathias has shown, but do not, as he points out, figure much in the conventional historiography of cotton and iron.<sup>7</sup> But no matter. Using for Britain proper the conservative Crafts and Harley figures (and very roughly factoring in some sluggishness for Ireland), before national income is more accurately measured in Charles Feinstein's estimates from 1855 on, Angus Maddison gives a series of U.K. per capita income in "1990 international Geary-Khamis dollars" thus:

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<sup>7</sup> Mathias 1953 (1979), p. 209; and Mathias 1959.



**Conservatively Measured,  
the Improvement in the U.K.  
Occurred Sometime Around 1800,  
then Accelerated**

	Real annual GDP per head in 1990 dollars	Annual growth rate from previous date	Population
1600	\$ 974		6.2 million
1700	1,250	0.25	8.6
1820	1,706	0.26	21.2
1850	2,330	1.0	27.2
1870	3,190	1.5	31.4
1913	4,927	1.0	45.6
2001	20,127	1.6	59.7

Source: Maddison 2006, pp. 437, 439, 443 for real GDP per head; pp. 413, 415, 419 for population. Growth rates are compound annually.

We optimists would complain that one can detect widespread productivity change in the eighteenth century, measurable for example by input and output prices in dozens of industries, and in patent applications for entirely new products (though we would admit that the work on primary sources needed to be quite sure of the calculation has not been done widely enough—for example by me only for enclosure of open fields), or by testimony up and down the country in novels and plays and letters about improved roads and agriculture and humming industrial districts making beer and toys and watches and cutlery (though we would admit that the work on these primary sources, too, has not been done widely enough, and this time certainly not at all by me). And therefore we would see a quickening of growth some decades earlier.<sup>8</sup> Indeed, we believe that there are good reasons to think that the slow-growth Industrial Revolution of the Two Nicks contradicts pretty solidly documented progress in a wide range of British industries in the classic period 1760-1860. The Nicks argue that productivity outside a few progressive sector was nil—which contradicts the industrial studies. The aggregate statistics of the Two Nicks, therefore, must be too low, because they imply an implausible nil productivity growth in glass, chemicals, shoemaking, brass, toys, instruments, and the like calculated as what's left over.

But let us live easy: these are differences of emphasis. We all, optimists and comparative pessimists alike, agree that something extremely strange, and

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<sup>8</sup>

For a contrary view, claiming in the Two Nicks style that “output growth before 1800 was largely driven by an ‘Industrious Revolution’ “[to use Jan de Vries’ terminology], see Broadberry 2003, p. 253.

enriching, and world-changing, took place in parts of Britain somewhere around 1820, give or take forty years. For most if not all scientific purposes 1820 ± 40 years is accurate enough, and especially in view of the astounding enrichments that followed. Surely by 1860 (say) a much larger nation was much richer per head, and much more likely to sustain innovation, as never before in history. Britain was beginning the factor of sixteen.

The enrichment was noticeable to some even in 1830. Macaulay wrote then:

If any person had told the Parliament which met in perplexity and terror after the crash in 1720 that in 1830 the wealth of England would surpass all their wildest dreams, . . . that London would be twice as large . . . and that nevertheless the rate of mortality would have diminished to one-half, . . . that men would be in the habit of sailing without wind and would be beginning to ride without horses, our ancestors would have given as much credit . . . as they gave to *Gulliver's Travels*. Yet the prediction would have been true.<sup>9</sup>

In his *Essay on the Principle of Population* (1798) the Anglican priest and economist Malthus had predicted the opposite. His point is still popular among radical environmentalists, who view natural resources per human as the problem, or perhaps just humans, and dream of the Garden without Man and watch with delight the TV show "Life After People." They do not realize that natural resources ceased after 1800 to be the main scarcity. No longer, it is wisely said, are there resources, only human resourcefulness. Yet Malthus told a great truth about *earlier* history. In

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<sup>9</sup>

Macaulay 1830.

medieval England, for example, during the two centuries before 1348 a rising population *had* become poorer, and in Elizabethan England the impoverishment happened again, for the same reason of rising population facing a given stock of land. When land was still the chief resource in the economy, and economic resourcefulness was not the way to achieve honor, more Englishmen meant less land per head and therefore less grain per head. But in late Georgian and early Victorian England a rising population became through now-honored ingenuity a good deal richer, and land fell dramatically in its power to constrain humans. The fact was contrary to every prediction of the economists.<sup>10</sup> Most economists scorned the notion of free lunches, and still scorn it. In the sweat of your brow shall you earn your bread. One can shuffle labor and the like from one use to another, and gain efficiency, but never, the economists declared, can you gain easy gold at the hand of fey or elf. And therefore the economists, unlike the historian Macaulay or the engineer Charles Babbage, saw nothing in prospect around 1830 but misery for the working man and riches for the landowners. Like modern environmentalists the classical economists depended on blackboard propositions (“ultimately, all resources are limited”), not the evidence before their eyes.

In 1845 Mill summarized the matter with his customary lucidity and justice.

Until the Reverend Malthus wrote, the condition of the working class was

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<sup>10</sup> It is customary, by the way, to use Carlyle’s phrase “the dismal science” to encapsulate the pessimistic conclusions of the classical economists. But that was not its origin. Carlyle called his friend John Stuart Mill and Mill’s colleagues “dismal” because they opposed slavery, which institution Carlyle found sweet and medieval and appropriate to the sadly deficient abilities of black people (Persky 1990; Levy 2001; Levy and Peart 2001).

considered by most a hopeless case – “a provision of nature,” as Mill expressed it, “and as some said, an ordinance of God; a part of human destiny, susceptible merely of partial alleviation in individual cases, from public or private charity.”<sup>11</sup> Malthus, at any rate in the second edition in 1803 of the *An Essay on the Principle of Population*, showed that in establishing that poverty was a consequence of population growth he had given reason for hope, not despair. (As a priest he perhaps worried about his earlier bald statement of the Principle of Population in 1798 because *acedia*, despair, a lack of Christian hope, is the second greatest sin against the Holy Spirit.) A given technology could support the poor in a little better style (as Malthus promised in 1803 and later editions) if they could only be made prudent and conscientious in having children – which a middle-way Anglicanism, for example, could preach in good conscience. Mill noted two additional forms of optimism, less plausible he thought (as late as 1845) than Malthus’ promise of modest improvement through sexual restraint. “The only persons by whom any other opinion [than the age-old pessimism about the poor doomed to earn a dollar or two or three a day – maybe four if they will but adopt birth control] seemed to be entertained, were those who prophesied advancements in physical knowledge and mechanical art, sufficient to alter the fundamental conditions of man’s existence on earth; or who professed the doctrine, that poverty is a factitious thing, produced by the tyranny and rapacity of governments and of the rich.” From Mill’s other writings one can infer that he took little hope from the “prophesied advancements in physical knowledge.” In that

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<sup>11</sup> Mill 1845.

prediction he proved spectacularly wrong. He also did not believe that revolution and redistribution would work, either. In that he proved unhappily right.

The economists, in other words, did not notice that something entirely new was happening from 1760 or 1780 to 1860. As the demographer Anthony Wrigley put it a while ago, “the classical economists were not merely unconscious of changes going on about them that many now term an Industrial Revolution: they were in effect committed to a view of the nature of economic development that ruled it out as a possibility.”<sup>12</sup> At the moment (say, 1848) that John Stuart Mill came to understand an economy in equilibrium the economy grew away from the equilibrium. And by the time he died, in 1871, the growing away was accelerating worldwide. It was as though an engineer had satisfied herself of the statics that kept a jumbo jet from collapsing as it sat humming on the tarmac, but then failed to notice when the whole thing took off into flight.

The economists, believing as many of them do right down to the present that they have a complete theory of the social laws of motion, overlooked applied innovation. That is, they overlooked the creativity of the conversation in a modern economy. The economist Basil Moore has expressed the point in a brilliant critique of economics by saying truly that since the first Industrial Revolution the world economy has become nonlinearly dynamic.<sup>13</sup> The economist Friedrich Hayek (1899-1992) had expressed a similar point, that economies are unpredictable because they

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<sup>12</sup> Personal correspondence.

<sup>13</sup> Moore 2006.

are the outcome of human conversation.<sup>14</sup> The future of mathematics is unpredictable, because if it were predictable we would now know the mathematics that is supposed to be in the future. It wouldn't be future. The same is true of vast swathes of human activity, from fashion to engineering.<sup>15</sup> The static economics that Moore and Hayek criticize worked just fine before the Revaluation, and it still illuminates for the short and medium run many routine parts of the economy. Don't throw it away. But the economy after the late eighteenth century became increasingly non-routine, startled by steam engines, electrified by generators, confused by computers, and above all revived by Revaluations.

In 1767 Josiah Wedgwood (he of fine china) was writing that "a revolution was at hand," at any rate in the making of pottery.<sup>16</sup> In 1783 Samuel Johnson declared "The age is running mad after innovation; all the business of the world is to be done in a new way; men are to be hanged in a new way," and himself took an interest in new ways of brewing.<sup>17</sup> By 1787 the dissenting preacher, political radical, and insurance actuary Richard Price was still more broadly optimistic:

It is the nature of improvement to increase itself. . . . Nor are there, in this case, any limits beyond which knowledge and improvement cannot be carried. . . . Discoveries may, for aught we know, be made in future time which, like the discoveries of the mechanical arts and the mathematical sciences in past time, may exalt the powers of men and

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<sup>14</sup> Hayek 1945.

<sup>15</sup> As is argued at length in McCloskey 1990.

<sup>16</sup> Letter to Thomas Bentley, quoted in Mokyr 2008, p. 89 [\*\*\*or thereabouts]

<sup>17</sup> Boswell 1791, for 1783 (Vol. 2, p. 447).

improve their state to a degree which will make future generations as much superior to the present as the present are to the past.<sup>18</sup>

As was the chemist Humphrey Davy in 1802: “we may look for . . . a bright day of which we already are beyond the dawn.”<sup>19</sup> By 1814 the merchant and calculator Patrick Colquhoun was admiring “the improvement of the steam engines, but above all the facilities afforded to the great branches of the woolen and cotton manufactories by ingenious machinery, invigorated by capital and skill, and beyond all calculation.”<sup>20</sup>

And by 1830 an historian like Macaulay, as I have noted, respectful of the economics of his day but with a long view, could see the event better than could most of his economist friends. He wrote: “If we were to prophesy that in the year 1930 a population of fifty million, better fed, clad, and lodged than the English of our time, will cover these islands, that Sussex and Huntingdonshire will be wealthier than the wealthiest parts of the West Riding of Yorkshire now are, . . . that machines constructed on principles yet undiscovered will be in every house, . . . many people would think us insane.”<sup>21</sup> Later in the nineteenth century and especially in the socialist days of the mid-twentieth century it was usual to deprecate such optimism, and to characterize Macaulay in particular as hopelessly “Whiggish” and progress-minded and pro-innovation. He certainly was all that, a bourgeois to the core. But Whiggish and progress-minded and pro-innovation or not, he was in

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<sup>18</sup> Price 1787.

<sup>19</sup> Quoted in Mokyr 2008, p. 89 [\*\*\*or thereabouts]

<sup>20</sup> Quoted in Mokyr 1999a, p. 4.

<sup>21</sup> Macaulay 1830: I, ii, p. 185.



his prediction exactly right, even as to British population in 1930 (if one includes the recently separated Republic of Ireland, he was off by less than 2 percent).

The pessimists of Macaulay's times, both economists such as Mill and anti-economists such as John Ruskin, were off the mark, though at the time most fashionable – Schumpeter remarks in this connection that "pessimistic views about a thing always seem to the public mind to be more 'profound' than optimistic ones."<sup>22</sup> You look less of a fool if you predict disaster and it doesn't happen than if you predict progress and it doesn't happen – witness the career of the biological doomster Paul Ehrlich, which flourishes despite errors of prediction that would ruin the credibility of a scientist in most other fields, and even in economics. Or maybe it arises from a feeling that the gods or the devils will be angry if you predict progress. Better understate – such is said to be the origin of pessimistic routines of conversation among Yiddish speakers, even before the Holocaust made their pessimism look prescient.<sup>23</sup> People from Francis Bacon to Macaulay were the optimists of the Enlightenment. They thought of unlimited progress, not merely the respectable yet modest gains from trade. During the 1830s and 1840s the optimists (as Schumpeter did call them), Henry Carey in the United States and Friedrich List in Germany, with engineers like Babbage in England, "saw vast potentialities looming in the near future."<sup>24</sup> Optimistic fools they were (and Carey and List were foolish protectionists as well). But they were correct about the magnitude of the

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<sup>22</sup> Schumpeter 1954, p. 572n5.

<sup>23</sup> Wex 2006, p. 95.

<sup>24</sup> Schumpeter 1954, p. 572.

rising tide. Their opponents the classical economists were in their pessimism quite wrong. It could make one suspicious of fashionable pessimists nowadays.

Surely the slow start (faster probably than the Two Nicks say, but in any case slow by later standards) explains why industrial change was largely invisible to economists and some others watching it – though not to many possessed of common sense and eyes to see. Macaulay wrote in 1830, “A single breaker may recede; but the tide is evidently coming in.”<sup>25</sup> The tide indeed: the economics, as I said, explains the shape of the tide’s fingers invading the land, but not the force of the hand itself. The early Victorian poet Arthur Hugh Clough did *not* praise innovation – though the son of a cotton manufacturer, he hated the whole thing, as did most Romantics – and he would be irritated to see his verse used to capture what happened economically down to, say, 1860:

For while the tired waves, vainly breaking,  
Seem here no painful inch to gain,  
Far back, through creeks and inlets making,  
Comes silent, flooding in, the main.

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When did it start? Various emblematic dates have been proposed – the five months in 1769 during which Watt took out a patent on the separate condenser in his steam engine and Arkwright took out a patent on the water frame for spinning

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<sup>25</sup> Macaulay 1830, p. 185.

cotton; or 1 January 1760, when the furnaces at Carron Ironworks, Stirlingshire, were lit; or the famous day and year 9 March 1776, when Adam Smith's *The Nature and Causes of the Wealth of Nations* provided a rhetoric for the age. It sometimes seems that every economic historian has a favorite date, and a story to correspond. Eleanora Carus-Wilson spoke of "an Industrial Revolution of the thirteenth century." She found that the fulling mill (that is, a machine for thickening wool cloth) was "due to scientific discoveries and changes in technique," especially the control of water power, and "was destined to alter the face of medieval England," crushing the urban centers formerly leading in cloth.<sup>26</sup> Looking at the matter from 1907 the American historian Henry Adams could see a "movement from unity into multiplicity, between 1200 and 1900, . . . unbroken in sequence, and rapid in acceleration."<sup>27</sup> The economic historians Eric Jones and Joel Mokyr have taken a similar long view of European exceptionalism.<sup>28</sup> But the most widely agreed period of the beginning of It, whatever exactly It was that led to the factor of sixteen, is still the late eighteenth century.

If the onset of modern economic growth fed on itself, then its start could be a trivial accident. Joel Mokyr identifies a pitfall in storytelling: rummaging among the possible acorns from which the great oak of the Industrial Revolution grew "is a bit like studying the history of Jewish dissenters between 50 B.C.E. and 50 C.E. What we are looking at is the inception of something which was at first insignificant and

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<sup>26</sup> Carus-Wilson 1941, p. 41.

<sup>27</sup> Adams 1907 (1918), p. 498.

<sup>28</sup> Jones 1981, 1988; Mokyr 1990.

even bizarre,” though “destined to change the life of every man and woman in the West.”<sup>29</sup> In the case of the Industrial Revolution now the East. Yet one might wonder – the point will be made many times here in various different ways – why then it did not happen before. “Sensitive dependence on initial conditions” is the technical term for some “nonlinear” models – a piece of so called “chaos theory.” But under such circumstances a history becomes untellable.<sup>30</sup> It may be so – the world may be in fact nonlinear dynamic, as Basil Moore argues. But then we will need to give up our project of telling its history, because the true causes will consist of lost horseshoe nails and butterfly effects too small to be detected. The reasons are the same as those that make it impossible to forecast distant weather: “Current forecasts are useful for about five days,” writes a leading student of such matters, “but it is theoretically impossible to extend the window more than two weeks into the future.”<sup>31</sup> It is “theoretically” impossible because the fluid mechanics, the radiative transfer, the photochemistry, the air-sea interactions, and so forth “are violently non-linear and strongly coupled.” The flap of the wings of a butterfly in China can three weeks later cause a hurricane in Cuba.

Anyway industrialization happened at a stately pace. Britain was no factory in the mid-nineteenth century. In 1851 the number of British people employed in textiles, the frontier of innovation, was much smaller than in agriculture and a little smaller than in “domestic and personal service,” neither of which was much altered

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<sup>29</sup> Mokyr 1985, p. 44.

<sup>30</sup> McCloskey 1991a.

<sup>31</sup> Boyd 2008, p. 16. The two-week limit is why below I use three weeks as the timing of the “butterfly effect.”

from eighteenth-century technologies – though agriculture was beginning to be.<sup>32</sup> The economic historian John Clapham made the point in 1926, observing that in 1831 “the representative Englishman . . . was not yet . . . either a man tied to the wheels of iron of the new industrialism, or even a wage earning in a business of considerable size.”<sup>33</sup> “As late as 1851, he noted, half the household lived in “rural” districts, and only some of these contained factories or coal pits. “At what point” in the nineteenth century, he concluded, “the typical worker may be pictured as engaged on tasks which would have made earlier generations gape is a matter for discussion. It may be suggested here that this point will be found some rather long way down the century.”<sup>34</sup> The massive number of household servants makes the point, but even in manufacturing it was true. As Maxine Berg and Patricia Hudson have noted, some technologically stagnant sectors (building, say, or the making of clothing, or indeed all services) saw large expansion and bigger employment, some technologically progressive sectors saw little or none (paper making, until the stamp taxes were repealed). Some industries working in large scale units did little to change their techniques (naval shipyards early in the period). Some in tiny firms were brilliant innovators (the metal trades, from Britain’s big lead in using coal to boil stuff).<sup>35</sup> Immense mills in the famous sectors were not the whole of the factor of two down to the middle of the nineteenth century, and nothing like all of the later

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<sup>32</sup> Mitchell 1962, p. 60. Marx made a similar calculation, using the 1861 census to support his claim that machinery disemployed workers (Marx 1867 [1887], p. 488).

<sup>33</sup> Clapham 1926, p. 67.

<sup>34</sup> Clapham 1926, p. 74.

<sup>35</sup> Berg 1985; Hudson 1986, 1992; Hudson, ed. 1989,.

factor of sixteen. And steam power in Britain increased from 1870 to 1907 (“some rather long way down the century”) by a factor of fully ten, long *after* the dark satanic mills first enter British consciousness.<sup>36</sup>

The central puzzle is not why there was in Britain after 1760 or so a burst of what Joel Mokyr calls “macroinventions” (steam, textile machinery) but why the burst did not fizzle out later, as earlier times of innovation had – such as during the “industrial revolution of the thirteenth century.” “The ‘classical’ Industrial Revolution in the eighteenth century,” Mokyr notes, “was not an altogether novel phenomenon.”<sup>37</sup> Not altogether. But the continuation certainly was. As Mokyr says elsewhere, “perhaps the really important question is not one of why did the great inventions of the 1760s and 1770s take place, but why the wave of technological progress did not peter out after 1815 or so, as it had always done in the past.”<sup>38</sup>

Productivity change 1780-1860 was famously fast in textiles, and did nothing like fizzle or peter out. But even without considering new products the conservatively measured rise in national income can be seen in other ways. Cotton cloth that was a luxury in 1700 had become the commonest, cheapest cloth by the middle of the nineteenth century. It found new uses – new products were a push. In a small way the same thing has happened since 1982 in the making of “sandwashed” silk. And so for every fabric. Synthetic fibers like the first one,

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<sup>36</sup> Musson 1978, pp. 8, 61, 167-8. By the way, the usual identification of Blake’s image with cotton mills, used here, is doubtful. He probably meant “mills” in the sense of the monotonous and utilitarian grinding of grain.

<sup>37</sup> Mokyr 2008, p. 93 \*\*\* or so.

<sup>38</sup> Mokyr 2003, p. 55.

rayon, or the next big one, nylon, were once pretty expensive. Now you have a closet full of clothing made of all sorts of historically cheap fibers. A big closet. Six of them. I once helped a friend in New Jersey sort through and re-hang merely the T-shirts that her family had accumulated. We got to 300 that afternoon and stopped counting. Your great-great-great-great grandmother had a dress for church and a dress for everyday and maybe a coat, or at least a shawl, and maybe some shoes, or at least some clogs. In summer and in warm climes she went barefoot, and got hook worm.

You can best see productivity change in the prices of the things produced. Prices give the best if underused way of measuring productivity change before we get modern statistics on aggregates like “the capital stock” and other fancies. A piece of cotton cloth that was sold in the 1780s for 70 or 80 shillings (two months’ wages for a workingman) was by the 1850s selling for around 5 shillings (a few days’ wages), on its way by now to a few minutes’ wages. Cotton cloth moved from being fashionable like silk to commonplace like wool, in the same manner a century and a half later as did nylon (first called “artificial silk”) and other synthetics, or indeed at length silk itself. A very little of the decline in the price of finished cotton cloth was attributable to declines in the prices of raw cotton itself after the introduction of the cotton gin (perfected in 1793 on the basis of numerous earlier machines) and especially the four-fold increase in yields of cotton coming from breeding experiments in the American South, and the resulting expansion of cotton

growing in America.<sup>39</sup> But in other ways the price of inputs rose. By 1860, for example, wages of cotton workers had risen markedly over what they were in 1780. Why then did the price of manufactured cloth fall? It fell because organization and machinery were massively improved in cotton textiles, 1780 to 1860 – though not as massively as was yet to come.

The case is typical in showing more about the variation around average performance than one might at first think knowable. The calculation shows for example that productivity change slowed in cotton, because power weaving, which came late, was apparently less important than power carding of the raw wool and power spinning of the wool into yarn. And it exhibits one of the main findings of economic historians – that invention is not the same thing as innovation.<sup>40</sup> The heroic age of invention in cotton textiles ended by the late 1780s, by which time Hargreaves, Arkwright, Kay, Crompton and Cartwright had flourished. But the inventions saw steady improvement later. The pattern is typical, invention being only the first step – the same is true, for example, of railways, which improved in scores of small ways right into the twentieth century, with large falls in real costs. The real cost of cotton textiles had halved by the end of the eighteenth century. But it was to halve twice more by 1860. And then again and again.

Few sectors were as progressive in the classic period of the Industrial Revolution as cotton textiles. Productivity in iron grew a half to a third as fast, which makes the point that productivity is not the same as production. The

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<sup>39</sup> Olmstead and Rhode 2008a, 2008b.

<sup>40</sup> Compare Chapman and Butt 1988.



production of iron increased enormously in Britain 1780 to 1860—by a factor of 56, in fact, or at 5.5 percent per year.<sup>41</sup> (“Small’ growth rates,” as you might be inclined to think that 5.5 is, make for big factors of increase if allowed to run on: 5.5 percent is explosive industrial growth by historical standards, a doubling every  $72/5.5 = 13.2$  years; thus South Korea since 1953.) The expanding British industry crowded out the iron imported from Sweden and proceeded to make Britain the world’s forge. But the point is that it did so mainly by applying a somewhat improved technology (called puddling) to a much wider field, not by the spectacular and continuous falls in cost that cotton witnessed. The calculation goes thus: The cost of inputs to iron (mainly coal) changed little from 1780 to 1860. During the same span the price of the output (wrought iron) fell from £20 a ton to £8 a ton, another Good Thing, surely. The fall in real costs, again, is a measure of productivity change. So productivity in wrought iron making increased by a factor of about 2.5, an admirable factor of change. Yet over the same years the productivity in cotton textiles, we have seen, increased by a factor of 7.7.

Other textiles imitated the innovations in cotton, significantly cheapening their products, though less rapidly than the master industry of the age: as against cotton’s 2.6 percent productivity change per year, worsteds (wool cloth spun into a thin yarn and woven flat, with no nap to the cloth) experienced 1.8 percent and woolens 0.9 percent.<sup>42</sup> Coastal and foreign shipping experienced rates of productivity change similar to those in cotton textiles (some 2.3 percent per year as

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<sup>41</sup> Davies and Pollard 1988.

<sup>42</sup> McCloskey 1981, p. 114.

compared with 2.6 in cotton). The figure is derived from North's estimates for transatlantic shipping during the period, rising to 3.3 percent per year 1814-60.<sup>43</sup> Again the "low" percentage is in fact large in its cumulative effects: freights and passenger fares fell like a stone, from an index of around 200 after the Napoleonic Wars to 40 in the 1850s. Canals and railways experienced productivity change of about 1.3 percent.<sup>44</sup> Transportation was therefore among the more notably progressive parts of the economy.

But many other sectors, like iron as we have seen, experienced slower productivity change. The productivity change in agriculture was once believed to be slower still, dragging down the economy-wide average. The Two Nicks, supported by the researches of the ingenious Gregory Clark and other agricultural historians, believe it did much better, some 0.7 percent per year in productivity change.<sup>45</sup> Anyway, taking one year with another 1780-1860, agriculture was still nearly a third of national income, and so mattered a good deal, and its productivity change was slower than such leaders as cottons and worsted and canals and railways. Productivity change varied radically, as it has continued to do, one sector taking the lead in driving up the national productivity while another settled into a routine of fixed technique, computers taking over the lead from chemicals and electricity. Agriculture itself, for example, came to have quite rapid productivity change in the age of the reaper and the steam tractor in the nineteenth century, and

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<sup>43</sup> North 1968.

<sup>44</sup> Hawke 1970.

<sup>45</sup> Harley 1993, Table 3.6, p. 200.

selective breeding of animals and plants was probably even more important – still more so in the age of genetic engineering in the twentieth century.<sup>46</sup> But from 1780 to 1860 textiles and transport were the leaders. Bravo for the brave British.

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<sup>46</sup> Olmstead and Rhode, 2008a and 2008b.

## Chapter 9:

### **But Britain's, and Europe's, Lead was an Episode**

Yet one must take care. In the face of such wonderful activities in the eighteenth century and early nineteenth centuries it is customary for Europeans, and especially British Europeans, to puff with pride, and start talking about how anciently exceptional the Europeans, and especially the British, have been. Alan Macfarlane has long argued, and persuasively, that English individualism was ancient, showing up for example in marriage patterns among the Anglo-Saxons, at any rate when they got to England, and in the non-collectivist notions of property in the Germanic law before they had.<sup>47</sup> But the Chinese, after all, have their own exceptionality, which could plausibly have contributed to early industrialization. The people who managed to organize such astounding projects of collective engineering as the Great Wall and the Grand Canal and Admiral Zheng He's expeditions to Africa are not obviously incapacitated for economic growth. The same could be said of the Egyptians, the Romans, the Inca, or for that matter the Mississippian mound builders. But in the event the northwest Europeans and especially the British started modern economic growth, and so they tend to congratulate themselves, and view themselves as the naturally Top Nations. The rhetoric of nationalism, not to speak of racism, rather easily slips in. It provides a

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<sup>47</sup> Macfarlane 1978.

nice, self-justifying warmth if you are European, and most especially if you are British.

But until the nineteenth century, as sociologists and historians and economists such as Jack Goldstone, Kenneth Pomeranz, and Robert Allen have argued, the rich areas of, say, China were comparable in income to those of Europe, such as Britain.<sup>48</sup> The assertion has not been without challenge, from for example Broadberry and Bishnupriya (2005), who asserted that the rich areas of China looked more like the *poor* areas of Europe well before 1800. Hans-Joachim Voth and Nico Voigtländer (2008), building on the point, argue for a “first divergence,” that is, higher real wages in northwestern Europe than in the Yangtze Valley before 1800. Their argument is remarkable: the Black Death enticed people into towns, where they died (the Chinese cities were healthier), thus relieving Malthusian pressure and allowing real wages to rise. But no one disagrees that China was ahead in, say, 1500, and fell dramatically behind during the nineteenth century (the second and more important divergence). And that is the main point: European superiority was not ancient.

The group who in the past couple of decades have made the China-admiring discovery are called the “California School” (because many of its teachers are in California).<sup>49</sup> The School has taught (after graduate work, so to speak, with Jack

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<sup>48</sup> Goldstone 2003, Pomeranz 2000, Allen 2008.

<sup>49</sup> Goldstone 2002; he names R. Bin Wong, Kenneth Pomeranz, Richard von Glahn, Wang Feng, Cameron Campbell, Dennis Flynn, Arturo Giraldez, James Z. Lee, Robert Marks, and himself (all at the time residents of the Golden State); and Andre Gunder Frank, Jack Goody, James Blaut, and Janet Abu-Lughod. To which I would add Robert Allen and Francesca Bray. I myself was a spectator at some early conferences on the matter, and declare now that besides joining tardily the Cambridge/Johns Hopkins School of

Goody and Joseph Needham) that many of the claims of deep-set European exceptionalism – such as the European marriage pattern, or the inventiveness of Europeans in water- and wind-mills and the like, or Europe’s long lead in riches, or Marx’s analysis of the shift from oriental despotism through feudalism to the triumph of the bourgeoisie (Marx’s theory is the grand-daddy of Eurocentrism) – are erroneous.<sup>50</sup> “Some of the errors,” the historical sociologist Goldstone charitably suggests, “come simply from comparing a fairly detailed and learned understanding of change in Europe with a rather vague and over-simplified understanding of change in Asia.”<sup>51</sup> Thus Marx (1818-1883), for example, or the historian David Landes (1924- ).

Joseph Needham (1900-1995) and his sinologist colleagues inspiring the California School have shown in the past fifty years that the Chinese were in fact astoundingly inventive for millennia before the West caught the bug. (One awaits a similar demonstration for the South Asians: begin with cotton cloth and scientific grammar. Or the Arabs: begin with universities and astronomy and horticulture.) The West did not realize how much it owed to the Chinese, or in what ways it was anticipated – commonly by many hundreds of years, such as the blast furnace (which was thought to be Swedish) or thin castings of iron (thought to be Dutch). The Chinese had mapped their realm with gridded precision hundreds of years before Europeans cartographers were still inclined to fill empty places on maps with

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intellectual history I am an adjunct member of the California School of world history.

<sup>50</sup> Goody 1996.

<sup>51</sup> Goldstone 2009, p. 19; compare p. 47.

the equivalent of the proverbial “here be dragons.” Remarkably, until Needham’s scholarship the Chinese themselves, in the face of Western hubris, forgot their pioneering.

Robert Temple wrote in 1986 an engaging popular exposition of Needham’s twenty-four stout volumes.<sup>52</sup> He gives in the third, 2007 edition a table of 110 inventions anticipated by the Chinese, and often used on a large scale. (Simon Winchester’s popular biography of Needham has a fuller list of about 275, including such miracles as a wheelbarrow *with sails* from the sixth century C.E., and soil science or ecology from the fifth century B.C.E.).<sup>53</sup> We all know about paper, invented and in common use in China in the second century B.C.E. (even for clothing; though not used for writing until the first century C.E.). It was not manufactured in the West until the thirteenth century C.E., a lag of 1500 years. Or consider cardboard, invented two centuries before Europe caught on. Or the compass, invented and in common use in China in the fourth century B.C.E. (though not used for navigation at sea until the late first millennium C.E.), not adopted in the West until the twelfth century C.E., a lag again of 1500 years.<sup>54</sup> About the gun the Westerners were more urgently curious, and the lag was only 50 years after its invention in China in 1180 C.E. An economist would know of paper money, too, with a lag of 850 years until the desperate New Englanders thought to use it. An agricultural historian might have known that the iron-share, curved-moldboard

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<sup>52</sup> Temple 1986 (2007).

<sup>53</sup> Winchester 2008, pp. 267-277.

<sup>54</sup> Temple 1986 (2007): paper, pp. 92-95, compass, pp. 162-166.

plow, invented by the Chinese 500 years B.C.E., came from China to Holland in the seventeenth century, and thence to England. But few could have known before Needham that the Chinese invented the seed drill 1800 years before its use in the West, the crank handle 1100 years before, deep-drilling for natural gas 1900 years, the wheelbarrow 1300 years, a place for zero in a decimal system 1400 years, and knowledge of the circulation of the blood 1800 years before Harvey.

Needham's work established the now-accepted truth that European technology was inferior to Chinese (or Japanese or Indian or Arab or Persian or Ottoman) until about 1500, and in many ways was inferior still in 1700 (by which time Europeans still had not yet reverse-engineered or mechanized thin-wall iron castings, thin-wall porcelain, japanning lacquers, or the making and printing of fine cotton cloth). Other research has shown that up until about 1800 the per capita real incomes of the more prosperous parts of the West and the East were all about the same. The recent lead of Europe was nothing like ancient. Needham and collaborators and followers have shown that the claim by the historians Lynn White and David Landes for unusual European innovativeness stretching back to the tenth century appears to be overstated. The windmill, for example, was Arabic. True, the Europeans in the Middle Ages invented all by themselves the fulling mill to thicken wool cloth, and perfected the mechanical clock (given special emphasis by White, but invented according to Needham in the eighth century C.E. in China, and not until 1310 by the Europeans, having heard of the Chinese machine), and invented eye glasses, and dubiously independently, if you insist on Euro-centrism worthy of



the old Soviet regime, invented the blast furnace in Sweden – though long after the Chinese, and using, funnily enough, exactly the design of furnace pioneered in China in the century before.<sup>55</sup> Good for the Europeans. But by now most students of technology agree that the Europeans had to learn from the Chinese or others, starting in the late first millennium, the stirrup, horse collar, printing, multiple-masted fore-and-aft rigging, and literally hundreds of other inventions large and small. China ruled. Peter Perdue explains that the expenses of overland transport on the Silk Road required precisely “a mysterious fabric whose production technology China monopolized for two thousand years,” namely, that silk, finally stolen by the wily Italians, along with noodles.<sup>56</sup> In the early seventeenth century, Needham writes, “Francis Bacon had selected three inventions, paper and printing, gunpowder, and the magnetic compass, which had done more, he thought, than any religious conviction, or any astrological influence, or any conqueror’s achievement, to transform completely the modern world. . . . All of them were Chinese.”<sup>57</sup>

But Needham’s work shows something else, too, which he emphasized and puzzled over and which is most relevant to our story here. From the seventeenth century on the Europeans in a rising wave of creativity stole, copied, adopted, improved, extended, reverse-engineered, and above all applied what they had learned from the Chinese, and from anybody else they chanced to meet on their fanatical and profitable peregrinations – coffee from the Ethiopians via the

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<sup>55</sup> Needham himself makes the point about the blast furnace, in his introduction to Temple 1986 (2007), p. 10.

<sup>56</sup> Perdue 2003, p. 491.

<sup>57</sup> In Temple 1986 (2007), p. 10.

Ottomans, tobacco from the Native Americans. Lady Mary Wortley Montagu (1689-1762) brought the Ottoman method of inoculation for smallpox back to England, using it with success on her own children.<sup>58</sup> Down to 1800, true, one can argue as Goldstone does that the Europeans were merely “catching up with the advanced civilizations of Asia, which already produced high-quality cotton, porcelain, and cast iron in vast quantities.”<sup>59</sup> But while catching up, the Europeans were coming to admire bourgeois virtues, such as a hopeful and courageous project of innovation . . . and innovation and innovation and innovation.

By contrast in the few centuries before 1800 the Chinese (and the Japanese and the Ottomans and the Mughals and Aztecs and Incas) became for various reasons fatally satisfied with their own panoplies. For the Ottomans, Metin Cosgel, Thomas Miceli, and Jared Rubin note the contrast between the nearly three-century delay after Gutenberg in allowing books to be printed in Arabic script, against the lightening fast adoption of gunpowder technology.<sup>60</sup> Sheer conservatism might well explain the hostility of the Qing regime at Beijing to innovation, but it evidently cannot explain the print-gun case at Istanbul. Cosgel, Miceli, and Rubin show that gunpowder, if monopolized, strengthened the state, but the printing press was seen as a potential threat to the monopoly of religious authorities – and these provided the non-violent half of the state’s support, by offering loyalty to its legitimacy. Needham had argued that the “relentless experimentation” that overcame Europe

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<sup>58</sup> Jacob 2001, p. 23.

<sup>59</sup> Goldstone 2009, p. 32.

<sup>60</sup> Cosgel, Miceli, and Rubin 2009.

around 1700 was “like the merchant’s standard of value.” Precisely. Merchants in Europe – not state bureaucrats – came to rule, at any rate in matters of port improvements and glass making and trade to the Indian Ocean. In speaking to Western visitors Chairman Mao is supposed to have summarized the conventional regret about the three Baconian inventions: “Our fathers were indeed wise. They invented printing, but not newspapers. They invented gunpowder, but used it only for fireworks. Finally, they invented the compass, but took care not to use it to discover America.” His formulation (if indeed he said it) contains more than a little Orientalism, and the details are not exactly true. But there’s something in it.

Why the difference? One conventional argument is that the (often) unified Chinese state was bad for the bourgeoisie and their disruptive projects of innovation, at any rate by the eighteenth century. Owen Lattimore expressed the conventional explanation in 1940: “Europe changed in a way that led to a money economy [it did in fact not happen] and industrialism, while China changed in a way that created a centralized imperial bureaucracy, of which the personnel was recruited generation by generation from the landed gentry, whose combination of landed interest and administrative interest kept innovation well in check and prevented industrial development almost entirely. In Europe a varying landscape encouraged a number of different kinds of extensive farming and mixed farming. Even under feudalism there was a considerable need for trade.”<sup>61</sup> Since then doubt has accumulated that such a picture is entirely correct, and it is certainly not correct

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<sup>61</sup> Lattimore 1940, p. 393.

to believe that Europeans were forward in the development of a “money economy.” After all, the Chinese had even paper money centuries earlier.

But again there’s something in it. True, the Chinese invention of an educated bureaucracy beginning with the First Emperor (unifying China with fire and sword 221 B.C.E.) was preceded by imperial administrations in the ancient Near East, and reinvented by the Europeans as the imperial notion of Alexander’s and Caesar’s descendents in the Mediterranean, and then re-re-reinvented by the European nation state in the sixteenth and especially the seventeenth centuries C.E. and later (the Prussians were to call their version of it the *Beamptenstaat*: the bureaucracy state). The point in any case was to subordinate everyone to the emperor/king by robbing a senatorial class or a feudal aristocracy of its separate power.

Centralization on the scale of the whole of Europe had precursors in the bureaucracy of the Church, copied from that of the Roman Empire. Yet later and secular versions of the Europe-wide project could not be sustained – despite the earnest efforts of Charlemagne, Philip II, Louis XIV, Napoleon, and Hitler – at any rate until the peaceful conquests in our own times by the treaties of Rome and Maastricht.

The Chinese version, by contrast, was thorough and continuous – “a civil service unimaginable in extent and degree of organization to the petty kingdoms of Europe.”<sup>62</sup> (Chinese economic history can therefore be investigated with a wealth of statistics unimaginable in Europe until its own bureaucratic and statistical era after 1800.<sup>63</sup>) The Chinese bureaucracy, Needham argues, “in its early stages strongly

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<sup>62</sup> Needham in Temple 1986 (2007), p. 10.

<sup>63</sup> Rawski 1996 and Rawski and Li 1992.

helped science to grow,” albeit sometimes for such purposes as accurately casting the horoscopes of the emperor’s fourth son. But in its later stages, just as the Europeans learned to use such Chinese inventions as the belt drive, the suspension bridge, the spinning wheel, decimal fractions, the canal pound-lock, and sea mines, and indeed the examination bureaucracy itself, the bureaucracy “forcibly inhibit[ed] further growth, and in particular prevented a break-through which has occurred in Europe.” \*\*\*is this Needham?? The Hungarian-French sinologist Étienne Balazs found deeper historical roots: writing of “China as a permanently bureaucratic society,” he claimed that the sprouts of capitalism were crushed by the Confucian mandarins.<sup>64</sup> The historical sociologist Michael Lessnoff summarizes the supposed results of neo-Confucianism under the Qing: “the Chinese state, which earlier [say, from the First Emperor through the Sung] frequently sponsored technological innovation and economic enterprise, became the disseminator and enforcer of an anti-technological, antiscientific and anti-mercantile culture.”<sup>65</sup> European-style centralized states have done similar work in the twentieth century, forcibly if often democratically inhibiting growth in a protectionist New Zealand or a populist Argentina or an authoritarian North Korea.

What Lessnoff calls “the second Weber thesis” (the first and more famous being the erroneous one that Calvinism accounts for modern economic growth) is that “compared with their Islamic, Chinese, and Indian counterparts, European cities, not only in antiquity but in the Middle Ages, enjoyed much greater

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<sup>64</sup> Balazs 1964

<sup>65</sup> Lessnoff 2003, p. 363

independence.”<sup>66</sup> According to Weber, Lessnoff points out, “the concept and reality of *citizenship* were unique to the West. . . . The cities of China and Islam were amalgamations of clan and tribal groups, not unified communities.” This might well be true, and is amplified in fact by Balazs.<sup>67</sup> But we must again be wary of falling into the habit that Goldstone points out of starting with our detailed knowledge of our own West and contrasting it with a mythological picture of a Mysterious East. At its center, for example, the Roman Empire looked like the Eastern sultanate vivid in the Western imagination, Nero burning the city of Rome for seven days on a whim. But its bureaucracy and even its army was always small, and its cities governed themselves within the Empire. The city states of early Greece find answer in the free cities like Lübeck of the Holy Roman Empire, at any rate by the time in the European Middle Age it had become neither holy nor Roman nor an empire.

The dignity of cities in the West surely presages the Revaluation of the seventeenth and eighteenth centuries. It may have been new. Many Englishmen were taught by the astounding successes of the Dutch city states to turn away from the projects of honorable display characteristic of an aristocratic society. Joyce Appleby observed that “envy and wonder stimulated a great deal of economic thinking in England during the middle decades of the seventeenth century. . . . The sustained demonstration of . . . Dutch commercial prowess acted more forcefully upon the English imagination than any other economic development.”<sup>68</sup> Not all of

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<sup>66</sup> Lessnoff 2003, p. 362.

<sup>67</sup> It is sharply criticized by Goody 2006, Chp. 8.

<sup>68</sup> Appleby 1978, p. 73.

the English abandoned aristocratic values: many Englishmen continued to charge nobly for the guns, or to stake their wealth on the turn of a card. By the eighteenth century, however, many of them, especially the bourgeois among them and a surprisingly large number of embourgeoisified noblemen and gentry, were launched on careers of generating a wave of gadgets that has not yet ceased sweeping over us (to use the unconsciously brilliant phrase of an English schoolboy on an exam paper in economic history long ago).<sup>69</sup> An original accumulation of habits of free publication and vigorous discussion created, as Mokyr argues in *The Gifts of Athena* (2002), "a world in which 'useful' knowledge was indeed *used* with an aggressiveness and a single-mindedness that no other society had experienced before. . . . It was the unique Western way."<sup>70</sup> Well, perhaps not unique until the explosion of the nineteenth century – China in the second century B.C.E. looks pretty good at such using, as did fifth-century B.C.E. Greece, or first-century C.E. Rome. And not so incidentally the criterion of "usefulness" is not intrinsic in the invention itself, but is economically determined by consumer valuations.<sup>71</sup> Casting horoscopes about the coming battle will seem more "useful" in some systems of value than inventing another siege engine. But anyway the West kept going, and going, to all our gain.

We do not yet know for sure why the using of knowledge kept going in northwestern Europe, though many economic historians suspect that Europe's political fragmentation, "the ancient clotted continent," led to comparative liberty

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<sup>69</sup> Ashton 1948, p. 59.

<sup>70</sup> Mokyr 2002, p. 297.

<sup>71</sup> A point made to me by Pete Boettke of George Mason University.

for enterprise.<sup>72</sup> Yet against this the German lands, fragmented thoroughly up to 1871, were not until the nineteenth century places of much innovation in machinery (though very much so by the eighteenth century in music and philosophy). And India was at many times fragmented, with hundreds of rajas and languages, without a great deal of innovation coming out of it. And again, second-century B.C.E. China was unusually centralized but unusually inventive, too. Goldstone notes that being a part of a fragmented Europe sometimes helped and sometimes hurt.<sup>73</sup> Portugal, the very soul of entrepreneurial exploration in the fifteenth and sixteenth century, emerged from its union with Spain in 1640 without recapturing the spirit of “we must sail,” and became one of the least literate and least entrepreneurial of Western European nations.

Perhaps the fragmentation of Europe worked instead by way of a free press (remember Mao’s formula), acquainting more people with the new idea of applying new ideas. Such an argument would date the unusual creativity of European conversations properly, beginning small in the late fifteenth century and becoming cacophonous by the eighteenth century. On August 18, 1520 the press of Melchior Lotther at Wittenberg issued 4000 copies, as Luther put it, of a “broadside to [the Emperor] Charles and the nobility of Germany against the tyranny and baseness of the Roman curia,” *To the Christian Nobility of the German Nation*, and the next week the press was preparing over 4000 more of a longer version.<sup>74</sup> Perhaps had the

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<sup>72</sup> O’Neill 2009, p. 46. On the history see for instance Baechler 1971; McNeill 1982; Jones 1988; Tilly 1990; Macfarlane 2000, p. 274-275.

<sup>73</sup> Goldstone 2009, p. 45.

<sup>74</sup> Lehmann 1970, p. 4.



Emperor Charles V or Pope Leo X been able to exercise the sort of control over the presses of Germany that Suleiman the Magnificent of the Ottomans or the Qianlong Emperor of China could, the outcome would have been different.

The improved rhetoric permitted by a free press was slow in coming. Until the late seventeenth century, indeed, the press was doubtfully free even in England. In 1579 Queen Elizabeth, outraged by a pamphlet written by the Puritan John Stubbs attacking her negotiations for marriage into the French royal family, had his right hand struck off by a cleaver hammered home by a croquet mallet – after which he removed his hat with his left hand and shouted “God save the Queen!” But Cyndia Clegg has argued about this and other Elizabethan cases that the censorship was unsystematic – in the Stubbs case, for example, the law evoked was an arguably obsolete one referring to the former Queen Mary’s husband, not a claim to a routine right to censor all publications.<sup>75</sup> Stubbs, his publisher, and his printer were prosecuted for libel, not treason (had it been treason the punishment would not have been mere maiming but a slow death worthy of a Mel Gibson movie; Elizabeth in fact disingenuously claimed to seek a charge of treason in order to impress her French allies against the Spanish). Grave matters of national survival, Clegg argues, hung on the long dalliance of Elizabeth with the heir to the French throne. The time was, after all, before the defeat of the Armada. Censorship in China was much more thorough, such as in the eighteenth century executing a man and enslaving his family for printing the character for the Emperor’s name. Later censorships in

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<sup>75</sup> Clegg 1997, Chp. 6.

Europe, such as the Index of Forbidden Books, were routinely undermined by publication in other jurisdictions, first Venice and then Holland, and smuggling. Remember the *Chatterley* ban, or *The Tropic of Cancer*.

## Chapter 10:

### And Followers Could Leap Over Stages

At any event the results of the compounding of ancient Chinese (and Arab and Ottoman and Inca and African) inventions with modern European creativity lie around you right now – computers, electric lights, electric machinery, precision tooling, plastic printers, plastic fabrics, telephones, pressed wood, plywood, plaster-board, plate glass, steel framing, reinforced concrete, automobiles, machine-woven carpets, central heating and cooling, all invented in the nineteenth and twentieth centuries in a Europe that practiced science and innovation with a lunatic enthusiasm, and had no emperor to gainsay the practice. Therefore the old stage theories dating from the eighteenth century, which use an analogy with the growth of trees, are inapt. Smith, Marx, the German Historical School, Modernization Theory, the American economic historian Walt Whitman Rostow were all off the mark.<sup>76</sup> Countries do not resemble trees in growing strictly on their own, from the leaf, the blossom, or the bole.

And likewise, for the same reasons, the tree-like and stage-dependent metaphors that characterizes modern “growth theory” in technical economics are

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<sup>76</sup> Readers of a certain age will pause at the name Rostow. Yes, he was the same man who advised President Johnson to carry on fighting in Vietnam. In part for that reason, after the late 1960s Rostow, who in the 1940s and 1950s had been a Nobel-worthy pioneer in applying economics to economic history, became *persona non grata* in economic history.

misleading. No stages must be grown through of acorn, sapling, young tree, old oak. The younger “trees” can skip stages by borrowing leaves or whole branches directly from the older trees – just as the West borrowed from China, and now China is borrowing from the West. At the meetings of the International Economic History Association in September 1994 I asked a Uruguayan economic historian much infected by the new growth theory how long he thought it would take his country to catch up to the North. “Two centuries,” he replied. A theory, it seems, can drive sober scholars insane. It is contradicted by the historical evidence, from Germany in the nineteenth century to Taiwan in the twentieth, that a country that honors and liberates its bourgeoisie can achieve modern standards of living in a couple of generations.

The other popular and anti-economic metaphor is of a footrace, in which, naturally, countries that start later must take longer to catch up. Thus Gustav Schmoller of the German Historical School in 1884 justifying mercantilist regulations protecting the silk industry in Prussia:

Berlin in 1780-1806 stood *almost on a level* with all the other places where the silk industry was carried on. It was mainly through the silk industry that Berlin became an important factory town, and the town whose inhabitants were distinguished by the best taste in Germany. Of course people in Berlin could not yet produce quite so cheaply as the manufactures of Lyons *which were three centuries older*; in many of the

finer wares they *were behind* Krefeld, Switzerland and Holland; but they  
*had caught up with* Hamburg and Saxony.<sup>77</sup>

But earlier and later starts for the footrace do not matter in a world in which people can listen to each other, and learn. They can cut across the race track, or take a taxi to the head of the marathon.

For the same reason the recent theories popular in schools of business of “competitiveness” are not persuasive. Michael E. Porter’s book in 1990 *The Competitive Advantage of Nations* was largely ignored by economists, but created a stir among business-school academics. It speaks in baseball terms of competitiveness as depending on success in four corners of a “diamond” originating from a “home base.” The long distances in the great free-trade area of United States, for example, gave it a competitive advantage in the making of very large engines for motor trucks. Howard Davies and Paul Ellis, though, put their finger on the central confusion underlying Porter’s book – it confuses “‘competitiveness’ construed as productivity and ‘competitiveness’ construed as the market share held by a sub-set of industries.”<sup>78</sup> Being productive, producing a great deal with few inputs, is a good idea. No one would dispute that. It is called Getting Rich By Being Smart. But getting a large market share has little to do with Getting Rich, or Being Smart. Market share is determined by what economists since David Ricardo have called *comparative* advantage, not by absolute advantage. That India has a comparative advantage in outsourced computer advice, and a large market share, does not make

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<sup>77</sup> Schmoller 1884 (1897), italics supplied.

<sup>78</sup> Davies and Ellis 2000, p. 25 of internet version.

India richer than the United States, which itself has in fact an *absolute* advantage in computer advice – merely better uses for its graduate engineers than answering hysterical calls from elderly lady professors of economics in Chicago about the wretched Microsoft product she has been condemned to use.

The best that human frailty is likely to achieve in confusing comparative and absolute advantage is an old book of 1985 by Lester C. Thurow, an economist and then-dean of the business school at MIT. *The Zero-Sum Solution: Building a World-Class American Economy* treats income as being extracted like success in a footrace or American-football yardage from non-Americans, especially from Asian non-Americans (it is 1985 and the anti-Japanese panic is at its height). “To play a competitive game is not to be a winner,” Thurow declares. “Free-market battles can be lost as well as won.”<sup>79</sup>

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<sup>79</sup> Thurow, p. 59.

Thurow is off the mark. If the “competitive” game is free exchange and innovation, then almost everyone who plays the game wins, if not as a producer, then as a consumer.<sup>80</sup> Modern economic growth has *not* been “zero sum,” a point on which as I have said most economic historians of whatever politics agree. In the trade-and-imitate game the people in different countries exchange goods and services. Superior technologies in one place are soon enough adopted in another. It is not easy, but it happened massively 1800 to the present. In the long run it doesn’t matter that Davy, Swan, Edison, Latimer, Whitney, and Coolidge co-invented the incandescent light bulb in England and the United States. It burned brightly, and promptly, in Naples and Beijing. If you insist on looking at exchange and innovation as games, then they are games in which almost everybody wins, like square dancing. The “beaten” countries in the “competitive” game such as Britain end up richer than some of the “winners.” True, looked at from the factory floor a market with competing suppliers in Japan – or for that matter in California – *is* zero sum, which gives Thurow’s assertions an air of plain common sense. You can hear recent versions of the same xenophobic common sense from Lou Dobbs nightly on CNN. The game metaphor looks at one side of the economy, the producing side. Mercantilists of all ages have favored it. But as Adam Smith said, “Consumption is the sole end and purpose of all production [and therefore it is the end and purpose of all exports]; and the interest of the producer ought to be attended to only so far as

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<sup>80</sup> Compare Krugman 1996 attacking Thurow and James Fallows on just these grounds, for what he calls “pop internationalism.”



it may be necessary for promoting that of the consumer.”<sup>81</sup> We do not live to work, or to export. We work, or export, to live.

The metaphor of the zero-sum footrace in the theories of Defoe or List or Schmoller or Thurow or Porter or Dobbs or your local politician gets some of its appeal from a wider tragedy in which it plays, namely, the tragedy that eventually the rest of the world caught on to what northwestern Europe and its offshoots had stumbled into during the eighteenth and nineteenth centuries. Britain was first, and what happened in Britain has therefore been of interest. A Britain tragically surpassed in the footrace of nations tells a story easy to lament. The historian David Landes, for example, has long interpreted modern history as a footrace between Britain and the rest, in for example his classic work of 1965, reprinted and extended as a book in 1969, containing a conference paper of 1954, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*. His metaphor of “leadership” in a race pervades his rhetoric, as in his chapter headings – “Closing the Gap,” “Short Breath and Second Wind” – and “Some Reasons Why,” taken from a poem about a cavalry charge. He asks in the middle third of the book, “Why did industrial *leadership* pass in the closing decades of the nineteenth century from Britain to Germany?”<sup>82</sup> He answers that the British racers in the lead slacked off, and were beaten. “Thus the Britain of the late nineteenth century basked complacently in the sunset of economic hegemony. . . .

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<sup>81</sup> Smith 1776, IV.viii.49, p. 179. I will give citations to Smith in book-chapter-paragraph form because of the numerous editions with varying pagination, but page citations are to the Glasgow edition.

<sup>82</sup> Landes 1969, p. 326, italics supplied.

Now it was the turn of the third generation, the children of affluence [‘affluence’? British real national income per head in 1880 was about \$3500 in 1990 prices, equal in real terms to that of Sri Lanka in 2001], tired of the tedium of trade and flushed with the bucolic aspirations of the country gentleman. . . . They worked at play and played at work.”<sup>83</sup>

The evidence for such Victorian economic failure is slight. And in truth it would be strange if a Britain “beating” the world in the 1850s suddenly by the 1870s could do little right. The facts show that nothing so strange occurred.<sup>84</sup> Similar facts undermine the current fable in which the United States is cast in the role of the leader suddenly unable to finish the race. But what is more important here is that the entire business of thinking of ranks and league tables and races and football yardage in which nations are “beaten” or “decline” or “lose” tells the story the wrong way. The prize for merely second place was not poverty, or even loss of political hegemony. “Beaten” Britain is still the fifth-largest economy in the world, the second-largest source of direct foreign investment, a permanent member of the United Nations Security Council, and London is the second-largest financial center in the world. Before the British, the leading cases of “failure” were the Dutch of the eighteenth and nineteenth centuries. With what result? Disaster? Poverty? True, the Netherlands has ended small and militarily weak, a tiny linguistic island in a corner of Europe. Yet by any historical or international standard it remains

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<sup>83</sup> Landes 1969, p. 336.

<sup>84</sup> Broadberry and Irwin 2006, for example, show that Britain had a labor productivity “lead” (foot race talk again) in agriculture and services right through the 1880s.

fabulously wealthy (at \$38,000 per year per head in 2006), and indeed is still among the most influential investors in the world. Relative “decline” is no decline at all. As his children grow up, a father does not lament that his share in the poundage of the house declines. And on the other side of the league tables, after all, a relatively primitive Russia in modern times literally beat Napoleon, and then for an encore, though still relatively primitive, literally beat Hitler.

The foot-race metaphor mixes up political dominance with economic prosperity. The fevered essays in most issues of *Foreign Affairs* that predict the “rise” of China, say, or the “decline” of the United States freely mix the two. The rise and decline of nations, to borrow the book title by the economist the late Mancur Olson (1981), or the rise and fall of the great powers, to borrow the title by the historian Paul Kennedy (1987), suggests that coming in first matters vitally, in the style of Teddy Roosevelt’s “strenuous life.” It doesn’t. Kennedy is the most explicit, but the assumption that military strength explains why Westerners have a lot of cargo pops up all over.<sup>85</sup> It is nonsense, even from wise heads. The brilliant ornithologist and world historian Jared Diamond, for example, wrote in 1997 that “technological and political differences as of A.D. 1500 were the immediate cause of the modern world’s inequalities.”<sup>86</sup> Why? Because “empires with steel weapons were able to conquer.” But does military conquest make the conqueror rich? True, it makes him richer than his victims dead from smallpox and steel swords. But it

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<sup>85</sup> I refer to the question asked by Jared Diamond’s New Guinean friend: “Why is it that you white people developed so much cargo [goods] and brought it to New Guinea, but we black people had little cargo of our own?” (Diamond 1997, p. 14).

<sup>86</sup> Diamond 1997, p. 6.

does nothing to explain the gigantic enrichment 1800 to the present of the West and the North, and now the East and the South. Being Top Nation militarily is *caused* by being rich. It does not on the whole cause the riches. Killing aborigines or bossing around impoverished traditional peoples is not the way to get plate glass, political freedom, long retirement, stereo sets, magnesium ladders, the forty-hour week, and the higher education for serious spiritual growth.

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As the inventive panoply multiplies it becomes easier and easier to take advantage of it, and to adapt the panoply to one's own purposes, good or bad. The metaphors of a tree's growth or a football game or a foot race should give way to one of an exchange of ideas – though even the mutual advantage of a mere "exchange" of ideas is itself not quite apt. Tunzelmann has wisely remarked that technology "cannot be reduced to information, such as often found in economist's treatments. . . [It] has to be learned . . . through processes only partially understood."<sup>87</sup> These are what the chemist and philosopher Michael Polanyi called "tacit knowledge."<sup>88</sup> Tunzelmann gives Polanyi's example of learning to ride a bicycle: "no amount of printed instruction on how to ride will enable most people to hop on a bicycle for the first time and confidently pedal off." Another economic historian, the late John R. Harris, showed in detail that transfers of furnaces

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<sup>87</sup> Tunzelmann 2003, p. 84.

<sup>88</sup> Polanyi 1966.

technology for making iron and glass between so similar nations as Britain and France 1710 to 1800 depended on tacit knowledge difficult to convey.<sup>89</sup> It is a point that the sociologist of science Harry Collins has made about experiments. The tacit practices of one laboratory are difficult to reproduce, especially at the frontier of science where things are necessarily difficult.<sup>90</sup> Likewise here. And therefore the merely economic metaphor of a smooth “exchange of ideas” does not tell the whole story.

Anyway, England in the eighteenth century could not possibly have experienced the present-day Chinese growth rate of real income per head of 10 percent per year, even in its greatest booms – the Chinese of course depend on inventive ideas developed earlier in the West, such as earth-moving equipment and computers. The doubling of income per head in a mere seven years that such a rate implies could not happen before very recent times, with gigantic piles of the already-invented ideas such as the light bulb waiting to be adopted, if one will but let people use them for their profit and cease from sneering at and stealing from and executing those who do. Remember Edgerton and “the shock of the old.” Invent as you will paper or cast iron slowly over many centuries, it will not be enough for the breakthrough. What’s needed, wrote Madame Chen Zhili, State Councilor of China for Education, Science, Technology, and Culture in a touching preface to Temple’s popularization of Needham in 2007, is “innovation [which] is the spirit of a nation

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<sup>89</sup> Harris 1992, 1996, 2000.

<sup>90</sup> Collins 1985.

and the endless momentum for a nation's prosperity."<sup>91</sup> The innovation in China did not depend on China reaching the correct stage of growth, but on Madame Chen Zhili and her colleagues in the Central Committee finally allowing local mayors and businesspeople to try out experiments in non-communist economics, such as not shooting manufacturers or re-educating land speculators. Neighboring Burma and North Korea show what happens if you carry on with socialist or militarist policies to the contrary.

China and India, in other words, can take off the shelf the inventions laboriously developed by the Watts and the Edisons of the past three centuries – and by the Chinese and Indian inventors of earlier centuries, together with the Inca potato-breeders and the brass-casters of Benin, all of whose inventions had been taken up eagerly by the curious Westerners. Indians invented fine cotton cloth, which then became the staple of Manchester, but latterly in its mechanized form became the staple of Mumbai. The Chinese invent cast iron, which then became the staple of Swedish Uppland and English Cleveland and American Gary, but latterly with some additional chemical engineering the staple of the Kamaishi Works in Japan and now the Anshan works in China. And so Sweden in the late nineteenth century and then Japan in the early and middle twentieth century and China in the early twenty-first century caught up astonishingly quickly.<sup>92</sup>

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<sup>91</sup> In Temple 1986 (2007), p. 7.

<sup>92</sup> Stephen Parente and Edward Prescott explore the obstacles to taking off the shelf (Parente and Prescott 2000).

A poor country that adopts thorough-going innovation, therefore, can catch up to the West in about two generations. It has happened repeatedly. Consider such miracles of leaping over putatively inevitable stages as Taiwan or Hong Kong or Singapore. Perhaps we should stop being gobsmacked every time it happens. Give people liberty to work and invest, and treat them with dignity, and you get fast catching up. Goldstone puts it this way: “What Japan's success does demonstrate is something that has been shown in Korea and Taiwan as well – that a unified people under firm government direction determined to import and implement Western industrial technology can do so in about four decades. This is about the time it has taken to transform South Korea from an African level of agricultural poverty to one of the world's leading industrial economies; similarly for Taiwan. Both have risen to this level from minimal beginnings after the Korean War of the 1950s and the Chinese Civil Wars of the 1940s.”<sup>93</sup>

Richard Easterlin would agree with the speed implied by the metaphor of “taking technology off the shelf.” He wrote in 2003 that “Since the early 1950s, the material living level of the average person in today’s less-developed countries. . . , which collectively account for four-fifths of the world’s population, has multiplied by threefold,” much faster than presently rich countries grew in the nineteenth century.<sup>94</sup> It has led to Paul Collier’s Top 5½ Billion. Similarly rapid has been the rise in life expectancy and the fall in fertility and the rise of literacy: on all counts it is

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<sup>93</sup> Goldstone 2002a, from electronic edition of 2001.

<sup>94</sup> Easterlin 2003, p. 347.

“a much more rapid rate of advance . . . than took place in the developed countries in the past.”

In other words, what does not need much scientific inquiry is how the Indians and Chinese, having been denied innovation for decades by imperial edict and warlord destruction and socialist central plan and lack of widespread education (the last is Easterlin’s argument), can get rich quickly by gaining peaceful access to well-stocked shelves of inventions, from the steam engine to the forward contract to the business meeting.<sup>95</sup> Routine economics says that after decades of disastrous economic luck the misallocations and spurned opportunities will be so great that considerable fortunes can be made pretty easily, and the average income of poor people can be raised pretty easily, too. Economists say, “People will pick up \$500 bills on the sidewalk” – unless, indeed, you jail people who specialize in picking up the bills, as once in Albania and still in Cuba. If Brazil and South Africa can be persuaded to adopt the liberal economic principles that are enriching China and India (and that enriched Britain and Italy more slowly and therefore less obviously), there is no reason why in forty years the grandchildren of presently poor Brazilians and South Africans cannot enjoy Western European standards of living. That’s not ideological prejudice, some wild neo-con fantasy in support of American imperial power. It’s a soberly obvious historico-experimental fact, which has already curbed American power. On the other hand, if Brazil and South Africa persist in unhelpful economic policies (such as South-African labor laws based on German models and

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<sup>95</sup> Easterlin asked “why the whole world is not developed,” and answered, building on work by the economist Mary Jean Bowman: inadequate education (Easterlin 1981)



supported by leftist ideologues and trade unionists eager to give the really poor corrupting handouts to keep them away from the job market), they can retain a gigantic underclass and an inferior position relative to the United States, just as long as they find that attractive.

So the modern spread of economic growth is no great puzzle. It is worth scientific inquiry, of course, but has the character of normal science, or normal investment. Permit people to take technologies off the shelves and adapt them to Brazilian or South African circumstances for personal profit, and the local bourgeoisie will do well for the nation, too. The Bourgeois Deal is “Let me get very rich by buying innovations low and selling them high (and please refrain from stealing from me, or from anyone else), and I’ll make *you* pretty rich, too.” The bigger scientific puzzle is how the shelves, or the sidewalks, got so well stocked in the first place.

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