Unmaking the West

"WHAT-IF?" SCENARIOS THAT REWRITE WORLD HISTORY

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84. In Tang times, women rode horses and played polo. The empresses in both the Tangut and the Liao states played important political and military roles.

85. See Allsen, *Mongol Imperialism*, for Mongol fiscal and political policies.

86. James T. C. Liu, *China Turning Inward: Intellectual-Political Changes in the Early Twelfth Century* (Cambridge: Council on East Asian Studies, Harvard University, 1988).

5.

CHAPTER 9

Without Coal? Colonies? Calculus?

COUNTERFACTUALS & INDUSTRIALIZATION IN EUROPE & CHINA

Kenneth Pomeranz

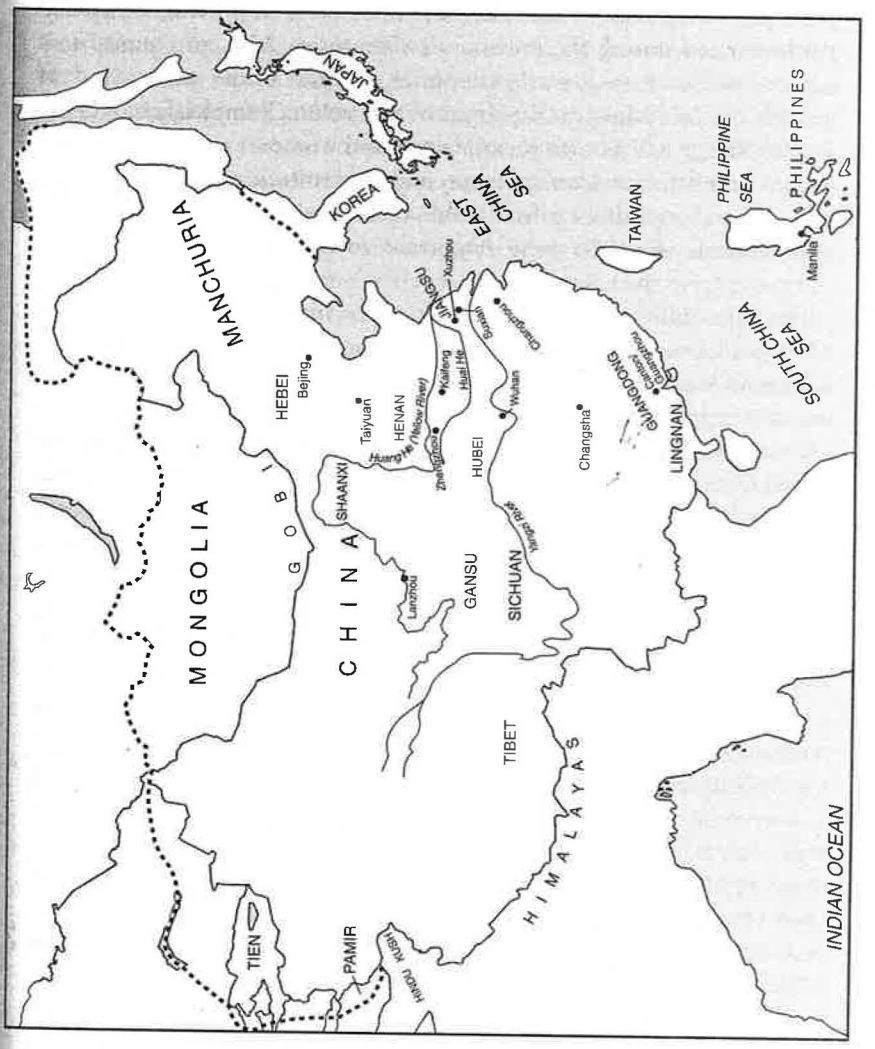
Background—Europe in a Chinese Mirror

The question of whether China could have had an industrial revolution is largely, but not entirely, independent of one less often asked. Could Europe have had a "Chinese" experience, becoming a society with highly productive agriculture, extensive handicraft industry, and highly sophisticated markets but no breakthrough to a world of vastly expanded energy use and sustained growth in per capita income—so that it eventually faced resource pressures that sharply limited extensive growth as well? Or to put it slightly differently, could the regions of Europe that industrialized in the first two-thirds of the nineteenth century (chiefly, though not exclusively, in Britain) have instead remained "stuck" in a Dutch or Danish configuration, which would have made them much more like China's Yangzi and Pearl River deltas? Although we will need to distinguish these questions carefully, there is enough material that is useful to both—and enough ways in which each sheds light on the other—that it seems to me worth asking them together. I adopted this strategy in *The Great Divergence*, which focused primarily on "could Europe have become China?" a question that, from the point of view of

this book, is essentially a "could Europe have 'failed'?" counterfactual. Here I return to the more familiar "could China have industrialized?" question but with my study of the other question very much on my mind. It is both the source of empirical statements about the relative state of X, Y, or Z in Europe and China that I will reuse here and also the source of many of the beliefs that I have been testing by examining the "could China have been a contender?" counterfactual in this essay.[1]

To put things crudely, I argued in the book that China and Europe, and more specifically the Yangzi Delta and England, their most advanced regions, were much more similar as late as 1750 than we have commonly realized. Standards of living appear to have been quite similar. Life expectancy was comparable.[2] Consumption of at least some of the non-grain foods that typically increase in early stages of sustained per capita growth (such as sugar) was also at least comparable, as were levels of production and consumption of textiles, also a common indicator of early growth according to Engel's Law.[3] And while certain aggregate indicators of welfare in China would decline over the 150 years after 1750, I would argue that this did not indicate the "overpopulation" that many scholars claim doomed nineteenth-century China. Indeed, standards of living seem to have continued to inch upward in many Chinese regions, at least until 1850. Any overall decline in per capita consumption before the great catastrophes of the mid-nineteenth century probably reflected in large part greater population growth in the poorer regions of the country, so that the weight of advanced regions in empirewide averages declined rather than a deterioration of economic circumstances within most regions.[4] Institutionally, the eighteenth-century Chinese economy may well have more closely resembled an idealized market economy than did Europe's at the same time (though neither was all that close): certainly it is hard to find in mid-Qing China crucial blockages to the kinds of exchange, development of markets, or accumulation and deployment of resources needed for industrialization. To be sure, the economies of eighteenth-century China and Europe (or the core areas of each) were not identical; but by no means did all the economically relevant differences favor Europe.

To frame the problem slightly differently, one can distinguish a kind of growth that involves successfully exploiting all the opportunities available with given resources and technology, mainly through developing increasingly efficient markets and the division of labor, from growth that shifts the production possibility frontier outward through technological change and/or resource windfalls. During the nineteenth century, the



Map 5. Boundaries of the Qing Empire at its height

North Atlantic countries began a staggering burst of this latter kind of growth, which continues to this day; clearly that burst must have had some preconditions, which we can see as European advantages. This does not, however, tell us whether Europe was doing better than China (or perhaps other places) at the first, "Smithian" kind of growth, which had predominated during the previous few centuries. Nor, of course, does success at Smithian growth guarantee success at the other kind of growth. As Joel Mokyr (chapter 10 of this volume) emphasizes, technological change has its own prerequisites, and whatever they may be, they do not simply follow from getting economic institutions "right." I would also argue (here differing from Mokyr) that both technological change and resource windfalls were important to distinguishing the modern European from the Chinese path.

Perhaps most surprisingly, despite very high population densities, China's core regions do not seem to have been doing any worse ecologically than Europe's in the eighteenth century. I have reconstructed nitrogen fluxes from dry-farming areas of North China and England, circa 1800, and they do not show more severe soil depletion in China, and if we added China's paddy rice regions to the comparison,[5] it would get rather lop-sided in China's favor.[6] Even for wood supply and deforestation, there is no clear Western Europe advantage circa 1750, despite its much sparser population. The Chinese used land and fuel more efficiently—thanks to everything from more labor-intensive fuel gathering to more efficient stoves to greater use of crop residues—and they were actually better off in many ways than Europeans.[7] Cores at both ends of Eurasia, I would argue, faced a crucial race in the eighteenth century between mounting ecological pressures and the resources available to counteract these pressures (about which more shortly). These pressures were evident in everything from rising real prices for timber and other land-intensive products to increased erosion (in both China and Europe) to increased flooding and a falling water table (mostly in China) to more frequent sandstorms, erosion, and stagnant per acre agricultural yields (also noted in Europe).[8] All things considered, it is not clear that the problems in China's core were the more serious ones.[9]

Broadly speaking, "development" in core regions meant an accumulation of both more labor and more capital and increased per capita consumption by the growing numbers of people present. But as long as one remained within a world in which Malthus's famous four necessities—food, fiber, fuel and building materials—came from plant growth, having a more or less fixed quantity of land was a potentially serious constraint

on such development. Roughly speaking, three kinds of solutions existed. One could trade manufactured products for vegetable products from elsewhere, in effect using plentiful labor and capital to purchase the products of somebody else's land; this, of course, required finding enough trading partners with the right factor endowments and an institutional structure that facilitated this trade (or imposing such a structure through conquest). One could adopt various strategies to maximize the ecologically sustainable yield of one's existing land—though in an age before chemical fertilizers and pesticides, most such strategies were extremely labor intensive. Or one could reduce one's dependence on annual vegetative growth, turning to subterranean stores of building materials and especially energy, which allowed mines with a relatively small surface area to substitute for enormous areas of woodland.

Chinese cores pursued the first option very successfully—so successfully that they were running into rapidly diminishing returns by the late eighteenth century. The same institutions that facilitated vast amounts of long-distance trade, with mostly freehold peasants in the interior trading rice, timber, and so on for cloth, salt, metal tools, and so on, eventually facilitated both enormous population growth and the development of more local handicraft industries on the periphery: both had the effect of reducing the surplus of land-intensive products that those regions had for shipment to core regions. And the political structure that facilitated internal trade did not, for reasons to be discussed shortly, encourage a sufficiently rapid expansion of this trade to overseas areas (such as Southeast Asia), where institutional arrangements favorable to a more rapid expansion of trade would probably have required Chinese conquests. Nor, of course, did China have the geographic and epidemiological luck that helped Europe create a vastly larger hinterland in the New World at relatively low cost to itself.

Chinese cores were also quite successful at exploiting the second palliative for resource constraints: kinds of land management and resource conservation (most of them very labor intensive) that allowed very high yields while slowing (though not completely stopping) environmental degradation. It is important to note that parts of Europe were doing this too: practices such as marling, for instance, raised yields and sustained the soil, but at the cost of significant declines in output per unit of labor.[10] Had other palliatives not succeeded on a huge scale in the late eighteenth and early nineteenth centuries, these areas might have continued still further in a labor-intensive, land-saving direction—in which case Northwest Europe would indeed have looked much more like the Yangzi Delta, the

Lingnan core, or Japanese core areas in the Kanto and Kinai. In Denmark, which may be the part of Europe that went farthest down this road, ecological stabilization was achieved, but industry (even handicrafts) grew very little before 1800, the share of the population living in cities did not increase before 1850, and both wages and per day returns to labor for self-employed farmers declined—all despite well-developed markets and involvement in Western European science.[11]

Moreover, while such strategies were quite useful for sustaining an existing standard of living, this kind of development did not move the society much closer to industrialization and sustainable per capita growth: indeed, if pursued for very long periods of time, they may lead to a balance of factor endowments that potentially inhibit the switch to capital-intensive and energy-intensive technologies.[12] Industrialization required instead a fundamental break with the constraint of production possibilities by the local supply of land—which China did not make but nineteenth-century Europe did, with the help of both fossil fuels and a staggering increase in land-intensive imports. It is probably true, as various scholars have pointed out in response to arguments that profits from the New World were important to European growth, that without the New World the labor and capital that crossed the Atlantic (or at least most of it) could have been profitably deployed nearer home.[13] But if the New World's crucial contribution was not increased financial profits but land-intensive real resources (including much of industrializing England's cotton and later much of its food and timber), it is much less clear that adequate substitutes were available elsewhere.[14]

Based on this sketch, I would argue that the big differences favoring Europe were: (1) advantages in certain, though not all, areas of science and technology; (2) a lucky geographic accident, the location of vast amounts of coal relatively close to the surface in England, where they were close to (a) wealthy areas with very high fuel demands (partly due to especially serious deforestation), (b) good water transport, and (c) a large concentration of artisans who were available to make the crucial improvements on the steam engines that made deeper mining possible and also made it possible to use coal to solve any number of other problems, including the transportation over land of the coal itself; (3) significant unexploited agricultural resources on various parts of the Continent, which could be brought into play to feed growing urban populations and were, ironically, still available in the early nineteenth century in large part because of pre-Napoleonic institutions (especially in Central and Eastern Europe) that had interfered with markets and

retarded development (and population growth) far more seriously than any market imperfections in China; and (4) access to the New World, which eventually made available a huge flood of land-intensive products and an outlet for tens of millions of emigrants (who in turn helped bring still more export-producing lands into production).

Probably few people would dispute that at least three of these differences (numbers 1, 2, and 4) mattered, though many would add others; much of *The Great Divergence* is devoted to undermining the case for some of the most commonly cited additions to the list (e.g., differences in property systems) by pointing to China's relative success at exploiting what was possible with its resources and slowly improving technologies and also noting some surprising European shortcomings in getting the most from its existing capital, labor, and especially land. And within this list of four, I put more emphasis than most scholars on the last three points, arguing that, at least for the stages of industrialization down to, say, 1860 (which were the ones that gave Europe its global predominance), science and markets alone could not have provided solutions to some of the resource constraints that faced core regions around the eighteenth-century world without the added benefits of resource bonanzas. Instead, Northwest Europe might well have found itself in a situation not unlike that of the Yangzi Delta or the Kanto and Kinai in Japan, with further gains from trade, specialization, institutional adjustments, and technical advances just barely staying ahead of population growth and even then only with the help of very labor-intensive efforts to maximize agricultural yields while maintaining soil quality, avoiding waste of scarce fuel, and so on.

In such a scenario, any emergent industrial sector would have had to be far smaller, both because of raw material and fuel constraints and because the share of the population that could leave the land would have been smaller: one can imagine fuel-hungry (and strategic) sectors such as iron and steel being particularly affected.[15] Given different factor endowments, technological change might have also taken different directions, saving more land and energy but less labor (and perhaps creating fewer entirely new goods). In all probability, the costs of projecting European power into other parts of the Old World would have been larger and the surplus available to bear those costs much smaller.

This economic scenario would still not rule out the possibility of significant European empires abroad in the nineteenth century. After all, the European forces involved in conquering and holding these empires were relatively small and often not even equipped with the latest

weaponry. However, it might well have reduced those empires in scale and duration. Furthermore, Europe's impact on the colonized societies would have been very different had these conquerors—like so many others in the past—brought with them some significant technological advantages concentrated in a few militarily significant sectors (such as iron and steel) rather than a generally transformed economy supporting a much higher standard of living and radically different patterns of work and resting on very large differences in per capita supplies of energy and other primary products.

Could China "Have Been a Contender"?

If European industry—and so its capacity to project military power—had grown much more slowly, East Asia would seem the most likely area to have escaped its gunboats. It was geographically remote, had large and relatively cohesive polities, and had a concept of war more like the West's than that of much of Africa, the Americas, and Southeast Asia (e.g., East Asians, like Europeans and South Asians, generally fought to gain land, not captives, and built large fortifications). Geoffrey Parker has argued quite powerfully that a "military revolution" that did not depend on industrialization nonetheless gave the West decisive advantages over many of its foes (a point I will leave to others to debate),[16] but he agrees that successful assaults on China and Japan required "steamships, steel artillery and sepoys. . . . They did not fall before the military revolution."[17] In such a context, would China have industrialized on its own? (I will omit Japan here for reasons of space, though it may actually have been better situated than China.) Parts of my answer can probably be inferred from the discussion of Europe above; others are laid out below.

It seems to me unlikely, though not impossible, that China circa 1750 was poised to have an industrial revolution anytime soon. This was not, I would argue, because of any of the deficiencies in economic institutions that some scholars have alleged (i.e., an overbearing state, inadequate property rights, a cultural bias against commerce, or a family system that encouraged population growth at the expense of capital accumulation); in all these ways, as I suggested earlier, China was as well-positioned as Europe. But China did face two important handicaps: less favorable resource endowments and less vigorous growth in science and technology. (At least in technology, it should be remembered that this slow growth was off an impressive base of accumulated techniques: this is less clear in at least some branches of science.)

Resource Constraints

Patterns of Growth and the Absence of a "New World"

By the late eighteenth century, the effects of both population growth and a slowly but steadily rising standard of living (which belies any straightforward "Malthusian crisis") were putting serious pressures on the ecology of various parts of China. These pressures were not that different from those faced by many advanced areas in Europe, but in the absence of the favorable "resource shocks" discussed earlier (and in the context of a different political economy), they worked themselves out very differently. Hinterland regions—which had supplied areas such as the Yangzi Delta with rice, timber, and raw cotton in exchange for manufactures—boomed, both in population and in their own handicraft manufacturing.[18] This reduced primary products exports to core regions: their growth essentially stopped, while labor and capital were redeployed out of manufacturing to manage land and fuel more intensively. After roughly 1770, population growth in the most advanced region of China (the Yangzi Delta) virtually ceased, not to permanently surpass the 1770 level until after 1950; other core regions continued to grow but much more slowly than China as a whole (which roughly doubled in population from 1750 to 1850).

The resulting economic pattern was in many ways "successful" if one does not judge it by the anachronistic standard of the industrial world: living standards probably held up fairly well in advanced regions, and improved in many hinterlands, until the catastrophes of the mid–nineteenth century (which had more to do with a political breakdown, exacerbated by imperialism, than economic failure).[19] Moreover, this pattern of development, in which best practices were changing fairly slowly but were diffused effectively across a huge landscape, generally fit the Ming-Qing notion of what an economy should do: allow as many people as possible across the huge range of environments in China a reasonably stable existence as independent producers able to support a family.[20] However, it did not move China any closer to industrialization; indeed, its reliance on increasingly labor-intensive kinds of land management to sustain more people at a comparable standard of living probably biased innovation in directions that did not make that more likely. By contrast, it is worth remembering here that the vaunted achievements of the "agricultural revolution" prior to the nineteenth century did not generally raise the best per acre yields significantly; they enabled roughly constant yields to be achieved with less labor (and allowed yields on lagging farms

to catch up to more productive ones). That kind of innovation alone could not sustain growth in a situation like that in which China found itself; it only helps if the labor thus liberated can feed itself by trading for primary products from elsewhere.

This resource squeeze did not rule out industrialization, but it biased the direction of innovation in ways that made a rapid wholesale transformation of the Chinese economy—or even the economy of a particular region—much less likely. (It should be remembered here that China is more comparable in size to Europe as a whole than to any European country, and a region such as the Yangzi Delta, with 37 million people in 1770, was larger than any European country other than Russia. Thus, even a breakthrough limited to "only" one such region would have been quite comparable to what happened in the first half of the nineteenth century in Europe, and the industrialization of "Europe" as a whole cannot be said to have happened until after 1945.)

Could China have found a bonanza of "ghost acreage" comparable to what Europeans found in the New World? This seems to me very unlikely without radically altering the world map (so that Fujianese going to trade in Java might have been blown to Acapulco) and/or imagining changes in Chinese politics and society so basic that we would no longer be dealing with "China." Certainly some quite sparsely populated and potentially very fertile land in Southeast Asia lay within easy reach of Chinese ships, and no new technology would have been needed to turn them into "rice bowls" exporting primary products back to the mother country (as happened after 1850 once colonial regimes both enforced property rights in these areas and allowed large numbers of immigrants to come and stake claims to them). But the political conditions for such an initiative were not present in some areas and emerging only slowly in others; and, as the reasons for that were long standing, attempting to remove them would probably not pass the "minimum rewrite" rule.

The costs of conquest, government, and infrastructure development for major Chinese rural settlements in Southeast Asia would have been very large, and there was no clear reason why Chinese merchants should have undertaken those costs without government backing. After all, even in the New World (where the costs of conquest were greatly reduced by the natives' lack of immunity to Old World microbes, while for Chinese going to Southeast Asia the disease gradient ran the other way) these costs were sufficiently large that people would only finance New World colonization if they could find something in the colony to export back home into a market in which high markups were guaranteed. European

sovereigns, hungry for tax revenues to support incessant and increasingly expensive warfare, were willing to grant and enforce the necessary monopolies and, as the colonies themselves came to be seen as valuable prizes of war, began to underwrite much of their defense and government directly. And for some of the most lucrative New World exports, geography and climate dictated that an import monopoly was a sales monopoly; sugarcane, for instance, simply would not grow in Europe.[21]

By contrast, although a Chinese merchant/pirate outfit such as the Zheng family empire of the seventeenth century certainly had the capacity to conquer various parts of Southeast Asia (driving the Dutch off Taiwan, capturing and holding various ports all the way to Java for many years, and controlling many of the shipping lanes),[22] it never had access to the sort of protected market back home that would have made it worthwhile to undertake systematic, large-scale settlement. On the contrary, the Zheng flourished only in a dynastic interregnum and never had as firm a grip on any Chinese port as they had on various spots overseas. Even had a less effective Qing military given the short-lived Southern Ming more time to solidify itself, it is far from clear that it would have done so, or that it would have maintained strong ties to the Zheng and their overseas empire.

In more normal times, both the Ming and Qing sometimes supported merchants who traveled abroad (defined as staying away less than three years), but neither dynasty would protect Chinese who settled abroad.[23] The Qing were certainly interested in frontier expansion (acquiring an area roughly half the size of the United States between 1683 and 1759), but this land was in mostly arid and/or mountainous Central Asia and was conquered to create a security zone, not to gain control of economically attractive resources.

For the most part, the Qing did not face the sort of military competition among relative equals that led to innovative fiscal measures and support for mercantilist colonization in the Atlantic world; indeed, since they considered internal discontent the main threat to their rule, the idea of encouraging new, heavily taxed popular "needs" for such things as sugar or tobacco would have made no sense to them.[24] Last, but by no means least, even if the Qing had had a very different attitude toward overseas expansion, almost anything imported from Southeast Asia would have faced substantial domestic competition (Guangdong Province was quite possibly the world's largest sugar producer circa 1750, for instance), which would have limited per unit profit margins on imports.[25] Given all these conditions, the possibility of the Qing provid-

ing either the direct or indirect backing that Chinese merchants would have needed to make it worth laying out the huge overhead costs of major agricultural colonies in Southeast Asia seems close to zero.

In the absence of state backing for a Chinese venture, most of these lands remained unexploited until much later. Neither the indigenous kingdoms nor the early European colonial regimes in the islands were willing to grant secure property rights in land to Chinese immigrants; indeed, in some of the more promising areas (near Batavia and Manila), even the lives of members of the large Chinese merchant communities were at substantial risk from recurrent massacres.[26] This situation certainly encouraged these merchants to stay liquid and buy land back home (as many did), if they wanted land, rather than sinking huge amounts of capital into bringing over their countrymen to drain swamps or clear jungles. Meanwhile, none of the rulers of these areas had the capacity to develop these lands as export-oriented rice bowls themselves; they were unwilling (probably because they felt too insecure) to accept a huge flood of Chinese or Indian migrants and (in the case of the colonial regimes) unable to bring in nearly enough Europeans to do this job.[27]

On the mainland, things were somewhat different and perhaps more promising in the long run. Victor Lieberman has suggested more of a trend toward agricultural intensification in mainland Southeast Asia prior to colonialism than we had previously recognized and toward states willing and able to enforce property rights to reclaimed land if this resulted in increased tax revenues. But Lieberman sees this as a cyclical process in which the gradual consolidation of stronger territorial states was punctuated by periodic breakdowns, and in the late eighteenth and early nineteenth centuries all of these states were suffering acute crises.[28] Under these circumstances, the long run was unlikely to arrive soon enough for purposes of a China needing large increases in its supply of basic primary products. In sum, then, while merchants in China's most advanced regions continued to find some new frontiers (such as Southern Manchuria) in which to swap their manufactures for primary products (as old internal frontiers filled up and developed their own handicrafts), they could not find any that were nearly large enough to let them maintain the "small country assumption," and it is hard to find a plausible counterfactual in which they could have done so anytime soon.

Fossil Fuels

The other important positive resource shock that Northwest Europe (at first mostly England) experienced was the turn to fossil fuels; each ton of coal mined provided roughly as much energy as the sustainable harvest from 1.0 to 1.4 acres of prime temperate zone woodland,[29] and coal production soared in the eighteenth and especially nineteenth centuries.[30] Here, too, China had serious disadvantages. It may be easier to imagine these barriers being overcome than the barriers to creating a Chinese New World, but the obstacles were still large enough to make the probability of a fossil fuel breakthrough anytime soon low.

Although China has lots of coal, and had used coal for centuries, there were various, largely accidental reasons why a fundamental shift to fossil fuels like that made by England was relatively unlikely in China's advanced regions. The eighteenth century Lower Yangzi region—China's richest and one of its most deforested—stretched its supplies by trading along riverine and coastal routes for wood and bean cake fertilizer. (The fertilizer allowed people to burn for fuel grasses and crop residues that would otherwise have had to be returned to the soil.)[31] While such trade-based palliatives did not rule out simultaneous experimentation with fossil fuels—the two coexisted elsewhere and might have done so in the Lower Yangzi without leaving many traces in the documents—it was hardly likely that coal in particular would have attracted much attention from the Lower Yangzi's artisans and entrepreneurs: there was little coal either in the region itself or in places easily accessible to its traders. China's nine southern provinces have just 1.8 percent of contemporary China's coal reserves and its eleven eastern provinces 8 percent; by contrast, the northwestern province of Shanxi plus Inner Mongolia have 61.4 percent.[32] Some coal mines did operate in various parts of South China, and within marketing range of Beijing in the north,[33] but they were mostly small, poorly positioned to take advantage of China's richest and most fuel-hungry market, and, especially in Ming times, intermittently hampered by inconsistent government policies.[34] By far the largest deposits, which theoretically might have justified major investments in production and transportation improvements, were those in the distant and landlocked northwest; since the price of coal in this area doubled with every twenty-five miles it moved over land,[35] such improvements would have had to be very dramatic to make coal an affordable solution for the fuel-hungry Yangzi Valley. (Transport costs were also the key to whether particular concentrations of potential fuel—whether timber, peat, or coal—were worth exploiting in preindustrial Europe.)[36]

While the returns to linking China's northwestern coal deposits with the Yangzi Delta seem so huge in retrospect that it is tempting to imagine some people making an enormous effort to do so, it is not clear how they

could have done it, and most of the returns to such a project that we can now imagine were invisible ex ante. Indeed the Yangzi Delta in particular is so poor in power sources—it has no coal or peat, never had much forest, is essentially flat (making its water useless for power), and is even poorly positioned for wind power—and in ores of all kinds—that one scholar has spoken of it following a "super light industrial path" in which energy-intensive production was simply absent from the region and its products were either acquired through trade or used very sparingly. Woks, for instance, used little iron and stir-frying in them economized on fuel.[37] If he is right, developers of northwestern coal not only would have had to imagine that they could extract huge amounts of coal and crack a seemingly insuperable transport problem but that suddenly cheap power would lead the Lower Yangzi to undertake various kinds of production in which it had not previously engaged. Meanwhile, northwestern coal miners, operating in a generally infertile, inaccessible, and backward region, were not particularly likely to learn of technical developments elsewhere that they might have been able to apply to their problems and had little chance of encountering artisans who had learned precise workmanship in specialized luxury crafts such as clock making. Such artisans did exist, and their skills, if not their numbers, seem to have been not far behind their Western counterparts—but they were almost all in the Yangzi Delta or along the southeast coast, where there was a veritable craze for clocks and mechanical toys with elaborate jack work.[38] And even if northwestern mine operators had seen how to improve their mining techniques, they had no reason to think that extracting more coal would allow them to capture a vastly expanded market: seemingly insuperable transport problems would still have separated their mines from the rich but ecologically needy fuel users of China's major cities.[39]

Finally, the biggest technical problem faced by northwestern Chinese coal miners was fundamentally different from that in England. English mines tended to fill with water, so a strong pump was needed to remove that water. But in the northwestern Chinese coal mines the water problem was secondary: instead they were often so arid that spontaneous combustion was a constant threat. It was this problem—one that required ventilation rather than powerful pumps—that preoccupied the compiler of the most important technical manual of the period, and while the problem was never fully solved, at least one contemporary historian of mining has pronounced the approaches described in that manual quite sophisticated for their time.[40] Even if better ventilation had ameliorated

this problem—or if people wanted coal badly enough to pay for this high level of danger—solving it would not have also helped solve the problem of transporting coal (and things in general), as the steam engines that pumped out Britain's mines did. It is important to remember in this context that early steam engines—prototypes of which had been developed in various times and places but not pursued—were so cumbersome, dangerous, and fuel hungry that initially they were seldom worth deploying anywhere except at the pithead of a coal mine, where fuel was virtually free.[41] Thus, the steam engine made the coal bonanza possible, and having coal mines that needed draining but were well worth exploiting and close enough to numerous artisans to facilitate improvements helped make steam engines worth tinkering with and perfecting. Overall, then, while general skill, resources, and economic conditions in "China," taken as an abstract whole, may not have been much less conducive to a coal/steam revolution than those in Europe as a whole—and were probably adequate to make such a breakthrough possible if they had come into combination—the distribution of those endowments made the chances of such a revolution much dimmer than in Europe.

There were a few coal mines that were closer to Jiangnan's market and artisans but not many. The mines in Xuzhou and Suxian in northern Jiangsu, not too far from the Grand Canal, would have been the best positioned among the few mines potentially within reach of the Yangzi Delta, but even there the cost of coal in Qing times doubled by the time it reached the county seat, which was also the canal port.[42] Like their counterparts farther north, these mines had been part of a heavy industrial complex (particularly focused on iron and salt production) in Song times and seem never to have fully recovered from a series of disasters (including huge shifts in the Yellow and Huai rivers and Mongol removal of most of the area's iron workers) in the twelfth through the fourteenth centuries that made the surrounding region poor. In the eighteenth century, when the government decided to encourage coal production in this area with the explicit goal of alleviating the Yangzi Delta's fuel shortage, it also chose to give the mining licenses to poor and unemployed people, who mostly dug small, shallow mines.[43] (The mines near Beijing were also generally small and not heavily capitalized, in part because the state preferred to avoid creating large concentrations of potentially rowdy miners.)[44] While it seems unlikely that even better capitalized mines would have achieved the major breakthroughs needed to transform China's energy, transport, and metals sectors, having such small opera-

tors in charge at the few sites in China where coal was within relatively easy reach of both large markets and concentrations of skilled artisans certainly did not improve the odds.

Still, this part of China's resource squeeze is much easier to imagine being reversed in a single, relatively uncomplicated counterfactual than the lack of a New World type of land bonanza—we could simply imagine that the northern Jiangsu mines had been closer to the size of the huge mines of the northwest. Under those circumstances, it is fairly easy to imagine another canal being dug to link this coal to the Grand Canal; much longer canals had been dug to move coal to iron smelters and other fuel-using industries near the capital (Kaifeng) during the pre-1200 coal boom. Thus one can imagine, without too much strain, one part of Europe's three-part resource bonanza being duplicated in China; and so it does not strain the minimum-rewrite rule to imagine the window for industrialization, which I have argued was closed by resource constraints, being kept open a while longer. And Chinese science and technology were probably up to the task of creating an economical steam engine and many of the other technologies of the First Industrial Revolution (as we shall see). Certainly one can imagine a large increase in coal mining had the resources been more accessible and in the production of various fuel-intensive goods (iron and glass, for instance) with potentially significant implications for the economy, military capacities, and perhaps also for further experimentation and technical progress. But to see what the chances were that China would have been able to create sustained per capita growth, we need to turn to an important disadvantage, which I discussed only briefly in *The Great Divergence:* the state of Chinese science and technology circa 1600–1850.

Science and Technology: Limits and Possibilities of a China "Left Alone" Longer

Chinese science and technology, though not (as some have charged) completely stagnant in the Ming and Qing, were less well poised to create a sustained run of technological breakthroughs than in Northwestern Europe. Technological change continued in the seventeenth and eighteenth centuries but at a slower rate than in the tenth to fourteenth centuries and with a bias toward land-saving rather than either labor- or capital-saving technologies. Chinese science, some branches of which went through what might be described as stagnation or even regression from the fourteenth through the early seventeenth centuries, had begun to move back onto what seems, in retrospect, a more promising track in

the seventeenth and eighteenth centuries. Lost mathematical knowledge was recovered,[45] philosophy moved in a more materialistic direction, European mathematical and scientific ideas (as filtered through Christian missionaries) were intensively studied, and lots of new empirical work was done in a variety of areas. (Some of the more active areas, such as optics and especially acoustics, were not very rich in immediate economic applications but represented new developments in physical science nonetheless.) A huge boom in the publishing of popular medical and agronomic texts indicates a fairly wide interest in at least practical "science,"[46] and far more literati than we had previously suspected were interested in more abstract developments in the physical sciences.[47]

Perhaps equally important, in the long run, the early Qing seems to have been marked by important developments in the way in which knowledge was produced and shared. In an essay on the Ming thinker Xie Zhaozhe (1567–1624), Mark Elvin notes that he showed at least some signs of all but one of what Alastair Crombie has identified as the characteristic styles of thought of Western science.[48] The one exception was the "postulational": a deficit that, even if it was societywide in Xie's time, was significantly reduced as various Chinese learned Euclidean geometry in the seventeenth century. (Initially, Euclid's work did not excite much interest, but as it proved to be extremely valuable for astronomical work, which people did care about, it came to be more widely studied.)

However, Elvin also notes an important puzzle with broad implications. Although Xie was a strongly empirical thinker who believed hypotheses had to be validated or invalidated on the basis of observed facts, he had no systematic method for weeding out falsehoods in the written statements of others: Elvin notes that Xie repeatedly reasoned logically about some natural phenomenon but made the wrong decision about which of various printed "facts" were actually true. Xie was diligent about searching the copious printed sources available to him—and the range of such sources would grow exponentially in the sixteenth through the eighteenth centuries—but institutions did not apparently exist to expose particular factual claims to continuing public scrutiny and report the results of reevaluation in easily accessible and verifiable ways.[49] Even more striking, Elvin adds that, though Xie had a wide network of correspondents across the Chinese empire, it never seems to have occurred to him to enlist these people in a search for data relevant to his hypotheses, nor did they use him in this way. Thus, while Xie had numerous theories about geology, epidemiology, nutrition, and zoology that could have been confirmed or overturned by systematic observation in

other parts of China, he never attempted to organize anything of the sort. As Elvin puts it, what was missing was the idea of a shared "'program,' a plan of collective systematic work" of a kind that seems to have emerged in sixteenth- and seventeenth-century Europe.[50] In chapter 10 of this volume, Joel Mokyr places considerable emphasis on this shared knowledge base and a network of people who were collaboratively and competitively expanding it as a crucial precondition for sustained technological development, and he argues that nothing very close to it existed outside the West.

But in the later seventeenth and eighteenth centuries, we see exactly this kind of network emerging in China as part of the so-called empirical research movement. Benjamin Elman notes a number of crucial developments among the increasingly dominant *kao zheng* (evidential research) scholars of the seventeenth and eighteenth centuries.[51] Notation books that recorded the new data a scholar found replaced the records of dialogues and spiritual progress common in the fifteenth and sixteenth centuries and were increasingly exchanged among scholars. Mathematics and mathematical astronomy were increasingly used to verify dates in ancient texts and expose impossible claims to have witnessed certain events; textual scholars were expected either to have the requisite mathematical skills or to consult (and credit) people who did. Collaboration among scholars with various specialties was increasingly common and was expected to produce improvements on ancient texts, not just recovery of them. In addition, increasing numbers of publications described themselves as follow-up studies to earlier works (whether or not the author had any personal connection with the earlier one), aiming to extend or adjust earlier findings in the light of specific new evidence.[52] Scholars working on the reconstruction of ancient tools, musical instruments, and other artifacts not only emphasized the need for mathematics but built actual models, published the plans they had followed, and encouraged others to try to reproduce their results and check them against archaeological finds.[53] Though no scholarly periodicals existed, letters about scholarly matters were considered public documents and were widely copied and circulated. Precise citation of sources became expected, and a new emphasis on making an original scholarly contribution emerged. In part because of this new emphasis on originality and progress, debates about scholarly priority became common (and sometimes heated); this also indicates that research methodologies and data were being widely exchanged, making such determinations difficult while testifying to precisely the sort of common research program that Elvin finds absent in the sixteenth century.[54] More and more branches of learning were affected by strategies of inquiry and standards of proof heavily influenced by mathematics on the one hand and experimentation on the other and by an expectation of progress.[55] Also interesting are the frequent references to scientific and mathematical techniques introduced by the Jesuits (and to the use of the Roman alphabet as a convenient device for recording phonological research)—particularly because the court had generally kept the missionaries at court in Beijing, hundreds of miles from the scholarly centers in the Lower Yangzi region (and later in Changsha and Canton), where we find people discussing their findings.[56] There was no close analogue to the European scientific revolution in late imperial China and no sign of significant progress in some fields that would eventually prove crucial to Europe's Second Industrial Revolution (e.g., electricity), but the climate may have been more conducive to such developments in the future than Mokyr suggests.

Still, it requires some very strong (and probably unjustified) assumptions to say that these trends would necessarily have continued if left undisturbed or that had they continued they would have produced effects comparable to those of Europe's scientific and technological breakthroughs. In the crucial matter of sharing and verifying information as part of a research "program," the patterns described by Elman had barely penetrated many of the lines of inquiry we would call the natural sciences.

Consider, for instance, the study of environmental change. China's "long eighteenth century" is full of important observations and hypotheses, some of them occurring in advance of the same points being established in Europe. The Kangxi emperor, looking back on many years of receiving reports on weather throughout the empire, made some important and largely accurate guesses about climatic change; the local official Niu Yunzhu, among others, gathered information about the effects of deforestation on future erosion, the ability of the soil to hold water, and perhaps even the extent of future precipitation itself; the early nineteenth century scholar Dong Bi'nan, looking at the long written record of everything from what crops were grown in his area to the frequency of tiger attacks on villages, made several shrewd observations about human activities, habitat change, and extinction; and scholars worried about environmental problems in the Lower Yangzi region figured out fairly subtle and difficult-to-observe ecological relationships, such as how changes in ground cover were lowering the water table.[57] At least some of their insights were ahead of what Europeans had figured out at the same

time.[58] But this knowledge was not systematically reported to anyone outside the localities involved (where it had policy implications). Thus when Niu, for instance, wanted to know how deforestation was affecting snowmelt, runoff, and soil moisture in his new jurisdiction, his approach was to summon an elderly and respected farmer from the area. Though a learned man, he apparently did not consult accounts of what had happened in other jurisdictions, and his conclusions were placed in a policy memorial that, as far as I know, did not circulate more widely until it was published in a collection of writings on statecraft eighty years later. The contrast to late-eighteenth-century Europe—in which a half century of odd weather (the so-called European monsoon) and related changes gave birth to systematic efforts to collect and share daily rainfall and temperature data from numerous locations, both in Europe and its colonial dependencies[59]—is striking, though just a few decades before China (where the state was already gathering monthly rainfall records for every prefecture in the empire)[60] would have compared quite favorably to Europe in the gathering of meteorological data. By the early nineteenth century we find more signs of a systematic program of research on these matters: scholar-landlords and scholar-officials in the lowlands of the Yangzi Delta seem to have been fairly well informed about changes in land use in highland areas well upstream of them and to have made use of local histories and anecdotal reports from those places to test hypotheses and scrutinize the predictions of people advocating particular state policies. But even at this fairly late date, it is hard to tell how systematic and organized a research program existed, even in the presence of hotly contested issues affecting direct material interests, which hinged in part on an understanding of the workings of nature.[61] Certainly the discussion was less scientifically sophisticated than the eighteenth-century English arguments about the building of water mills and their effects on factories downstream cited by Margaret Jacob as evidence of a spreading "scientific culture."[62] And it is also significant that as far as we know artisans were largely outside even such networks of "scientific correspondence" as were developing in seventeenth- and eighteenth-century China.

The development of correspondence, systematic citation practices, meetings, and so on to systematically share data on geology, epigraphy, historical phonology, and other fields is nonetheless quite significant. Among other things, it establishes that many of the villains often asserted to have made a scientific community devoted to cumulative empirically based progress impossible in China (a "despotic" state; an "established" Confucianism, with its supposed lack of interest in the material world,

belief that everything important was already known, and/or tendency to sweep all talented young men into the study of a sterile exam curriculum; the lack of universities or academies with secure corporate legal identities and privileges; and the absence of Western-style jurisprudence as a model for both the establishment of "facts" and the application of invariant rules)[63] were less of a barrier than has been claimed. Thus, China might have been in the process of creating such a culture of shared scientific inquiry—with all that implies for speeding up the rate at which new discoveries are made and slowing the loss of old knowledge—by its own path not too far behind early modern Europe. But the best we can say is that something of this sort was not foreclosed and its emergence might have been no more surprising than Europe's scientific revolution appears looking forward from the early Renaissance. And even had it emerged, a more recognizably "modern" Chinese science might well have applied itself to problems different from those of its European counterpart.

It would certainly be a huge stretch to say that, if left alone, China would have developed the technologies of the Second Industrial Revolution (based on electricity and systematic chemistry) anytime soon. Thus the assumption of various Marxist and Chinese nationalist scholars that had China developed "capitalism" sustained industrial growth would have followed seems quite unwarranted.[64] Here I should also note one way in which I was surprised as I worked through this counterfactual. While I never shared the position that industrialization was bound to follow from any particular set of economic arrangements, I was inclined to minimize the importance of science in the early stages of the process, while emphasizing "tinkering." But if one assumes that "sustained" growth would have eventually required exploiting electricity and the chemical processes that allowed coal and petroleum by-products to be turned into substitutes for so many vegetable and mineral products, the importance of science becomes undeniable. In fact, if one pushes it far enough, a belief in the sufficiency of tinkering for the First Industrial Revolution, and in the indefinite sustainability of that breakthrough without the further advances that occurred in the late 1800s, would threaten to reinstate something close to the position I was criticizing—namely, the belief that capitalism was bound to lead to industrial capitalism—having added only the proviso that resource shortages cannot be too severe. But one could make a stronger case for a more modest but still very significant claim: that given a different resource situation China's markets, skills, and other endowments could have pulled off a long period of sustained growth and industrial development based on First Industrial

Revolution technologies that were accessible without modern science. Such growth might not have lasted indefinitely, as Western technological growth has so far, but it might well have lasted several decades and given us a world with a strikingly different, less Western-dominated, political and military history.

Joel Mokyr (in chapter 10 of this volume) suggests that the possibility of a Chinese steam engine (and thus, presumably, a concomitant evolution in fossil fuel use, iron and steel use, and transportation) was considerably lower than suggested here. While acknowledging that the Chinese had the crucial bits of scientific knowledge and artisanal skill (e.g., in metallurgy), he nonetheless finds it "telling" that the relevant knowledge dates back close to two millennia in China without steam engines ever having been developed for regular use prior to their importation from the West, while in Europe working models appeared within roughly fifty years of the demonstration of atmospheric pressure. While this is an interesting contrast, I am not sure how telling it really is. The argument hinges on an implicit assumption that the epistemic environment in China was not changing much, so that the failure to convert prototypes into working machines in the past has predictive value for what would have happened in an undisturbed nineteenth-century China. Given the changes in intellectual climate during the late Ming and early Qing discussed earlier, this assumption seems shaky. After all, an advanced Martian surveying European history down to 1600 might have said the same thing, since steam-powered temple doors were known in Egypt shortly before the Roman conquest, but nothing further happened in the next eighteen hundred years. I am thus inclined to stick to my more sanguine view of the possibilities for a Chinese steam engine and to my claim that some of the principal obstacles had to do with accidents of geography, supplies of fuel and other resources, and perhaps government mining policies rather than with technological or scientific problems per se.

Many of the key technologies of the First Industrial Revolution—particularly the steam engine and its applications to transport and factory production—do seem to have been potentially solvable with existing Chinese science and would have been more likely to be solved if different factor endowments had encouraged work in those particular directions as much as they did in England. The Chinese had long understood atmospheric pressure and had the basics for a steam engine. Indeed, Needham argues that the common Chinese box bellows, which used rotary motion to produce a blast of hot air, was essentially a steam engine backward and the gear work needed to convert rotary to linear motion had been

available for centuries. A small toy boat powered by a steam engine had been demonstrated by a Jesuit priest at court in the eighteenth century, and Needham, at least, thinks he was working from both Chinese and European models.[65] And while Chinese mines of all kinds tended to be small scale, not very well capitalized, and surprisingly backward technologically, given the sophisticated use of (for instance) water pumps in other settings, it seems quite possible that once they had been in operation a bit longer (and so had depleted the deposits closest to the surface) those few mines that were well positioned with respect to the Yangzi Delta core might have found the means to adopt much better technologies (such as steam-powered pumps) had they been known. One could then imagine a gradually improving steam engine finding more and more uses, as occurred in Europe. But the odds of this happening before, say, 1900 without the machines being introduced from Europe were probably below 50 percent.

Moreover, even if we imagine a Chinese breakthrough in the related areas of coal, steam, iron, and steel, it seems much less likely that this would have turned into the sort of string of subsequent innovations and (so far) sustained growth that has occurred in the West; as far as I can tell, Chinese science would not soon have been up to the task of making major breakthroughs in (for instance) electricity and organic chemistry. And I would certainly agree with Mokyr that, despite a large number of skilled artisans, the odds against making most of the inventions central to these later stages of the Industrial Revolution by tinkering are too high to make this plausible. (This conclusion should certainly offend partisans of the Marxist and Chinese nationalist schools and, perhaps, in a different way, hard-core followers of Douglass North, for whom the rate of invention seems to be mostly a function of property rights in ideas.)

A Different Counterfactual: With Sino-Western Contact but No Opium War

What might have made the odds for a Chinese breakthrough better, however, would have been a situation in which one still had European expansion but in a weaker form.[66] If we imagine a Europe (as suggested earlier) with a much smaller industrial sector, because of more severe resource pressures, but with many of the same inventions, one might also imagine a rather different relationship between Europe and East Asia, one in which, unable to insist on an open market for opium, Europeans might have instead sold China more Indian cotton (as they did for a while

before opium took off),[67] more clocks, toys with elaborate gears, eyeglasses, and telescopes (for which there was a real craze among the elite in coastal Fujian Province and which Chinese artisans reproduced quite successfully),[68] and various other such goods, and in which the science and mathematics introduced by missionaries (which did find a receptive audience among some seventeenth- and eighteenth-century literati)[69] might have had a better chance of taking hold before a catastrophic political breakdown like the one that occurred when domestic problems and foreign pressures intersected in the mid-nineteenth century. (In another context, R. Bin Wong has suggested that under slightly different circumstances Europeans might have paid for some of their tea by selling arms;[70] had that trade taken off before China began to fragment politically, it might have solidified the Qing hold rather than undermined it further.) If one thus imagines China granted a few more decades of peace—not because the West did not show up at all but because it showed up differently—it becomes easier to imagine a major economic breakthrough than if China had simply been "left alone." At least parts of coastal China might have followed an economic path more similar to that of Meiji Japan. (The two were probably not far apart economically in the first half of the nineteenth century, and, except for having a somewhat larger window on the West, Japan's science was very similar to China's.) Under such a scenario, the extension of Western knowledge and trade might have done much to block the further extension of its political hegemony. One might still also need a major relaxation of Chinese resource constraints, which would hardly be certain but cannot be ruled out. Even in reality, parts of China benefited considerably from growing imports of rice from Southeast Asian deltas in the late nineteenth century, wood from various parts of the Pacific Rim, and so on, mostly paid for with light industrial exports, services, and remittances from overseas Chinese. With a more competitive manufacturing sector, and without the huge balance of payments problems created by opium imports and indemnities for lost wars, these imports could presumably have been much larger. And, as discussed earlier, a steam engine placed on ship or on rails could have delivered massive amounts of fuel to the Yangzi Delta, even if we do not imagine that coal being differently located. Of course, the combined probability of all these events is not large, even if individually they seem fairly likely, and even taken together they would not guarantee two centuries of sustained Chinese per capita growth without a steady stream of further technological change. So the combined probability of China being as thoroughly transformed as Europe, Japan, South Korea, and Taiwan have been over the last two centuries would remain remote, even without damage from Western imperialism. But a significantly better nineteenth and twentieth century for China—both economically and politically—does not seem so unlikely had the West been in contact with East Asia but lacked the industrial edge that allowed them to inflict devastating military blows fairly cheaply. And imagining such a scenario has its uses for discussing explanations of what did happen—to which I now turn.

Lessons of the Exercise—for Others and for Me

Whom should this last counterfactual—of a more beneficent East-West encounter leading to more rapid Chinese development—offend? How has working through it affected me?

In addition to the groups already mentioned, it seems to me this could offend a wide variety of people—from "modernization theorists" to strong believers in "moral economy" to many Marxists (or former Marxists turned geographically deterministic anti-Marxists, such as Wittfogel). All of these schools share a belief that China was a "traditional society" (or "feudal" or "oriental" or "Confucian" society, depending on the particular writer) that, for better or worse, could only have become modern by being blasted out of its entrenched way of doing things and being forced to adopt alien ways under threat of permanent subjugation.[71] If, on the contrary, a more limited and consensual set of contacts might have resulted in enough Western science and technology being grafted onto China's existing ways of doing things to result in substantial industrialization (especially if it was also accompanied by more accessible coal and/or a surge in raw materials imports), then a whole series of binary oppositions that have been common in history and social science do not hold water; modernity becomes (as much work on both early modern and more recent East Asian growth has also suggested)[72] much less of an indivisible "take it or leave it" whole that must transform an entire culture for sustained economic growth to occur.

Indeed, it was largely my unhappiness with such stark and all-encompassing contrasts between "the West and the rest" that led me into this research. If there had been significant similarities between the Chinese and European economies as late as the 1700s, then it seemed unlikely that they were as fundamentally dissimilar in their potential for sustained per capita growth as much of the literature suggested; the more I looked, the greater the similarities circa 1750 seemed. Moreover, it seemed to me that

many of the theories that posited some essential European cultural characteristic that made a breakthrough uniquely likely (e.g., Landes's "enterprise,"[73] which lumps together scientific curiosity, entrepreneurial drive and the freedom to pursue it, and geographic exploration and expansionism into a single phenomenon) or some basic Chinese failure (e.g., "despotism" or "traditionalism," said to inhibit all of these) were so broad that they could not possibly help us specify what differences really mattered, much less help us see the relationships among various differences and similarities. Thus counterfactuals that were at least in part beyond culture, such as the location of coal deposits or even continents, were attractive; so were counterfactuals that reversed only events a relatively short time before the nineteenth century. (Although changing geology or geography does, in one sense, involve going way back in time, it need not involve changing any human events relevant to our story before the relatively recent point at which the resource or place in question begins to matter for Chinese or European growth.)

Sometimes seeing what might have happened if we change these antecedent conditions helped me identify other factors that were more firmly embedded in Chinese culture and society, while simultaneously defining them more narrowly and precisely than most earlier comparisons did. Thus, for instance, the Chinese empire was not generally "xenophobic" and hostile to foreign trade, as is sometimes claimed—and Chinese society in general was still less so—but the regime did have an enduring set of priorities, rooted in their orientation toward reproducing empire, that made them indifferent or even hostile to overseas colonization and mercantilism. Similarly, Confucian paternalism and preferences for stability did not make the regime hostile to commerce, or to technical innovation in general, but they did make it suspicious of miners (who tended to form large, often migratory groups of males not firmly embedded in families) and prone to encouraging mining only when it met state needs (e.g., southwestern copper mines that provided specie) or helped succor the poor (the small-scale coal mining in northern Jiangsu discussed earlier).[74] While I would not say that a "minimal rewrite" of history would suffice to make independent Chinese industrialization very likely, I think it makes it plausible, and that slightly less minimal but still reasonable rewrites make big changes in results possible until roughly 1800. As I argued earlier, slowing European growth (without wholly stopping it), even as late as the late-eighteenth century, seems to me quite a bit easier than jump-starting Chinese growth in a world without foreign science; if many conditions need to be met for industrialization, it stands

to reason that it can be at least partially derailed within the minimal-rewrite rule.

For me, though, the main payoff of the counterfactual exercise comes from the joint result of considering both the Chinese and the European counterfactuals. That payoff comes not from imagining an industrialized China and a nonindustrialized Europe, since the joint probability of those two changes seems to me fairly small and the consequences so large as to be almost unfathomable. What strikes me as important about combining the two is that it changes the exercise we are engaged in. Asking "could China have 'succeeded'?" or "could Europe have 'failed'?" alone leads us back toward taking one path (usually Europe's) as normative and expected and asking why the other did not take it and therefore did not succeed or fail. Putting the two counterfactuals together, I think, is more useful for imagining whether there were other paths to similar results, and allowing that a different destination was possible along either path forces us toward more nuanced hypotheses of why what did actually happen was at least likely—hypotheses in which some differences may not have mattered or may have even weighed in the opposite direction from the difference in outcomes. Thus, a combination of counterfactuals seems to me to help us see the changing nature and direction of various China/Europe differences at various moments and to see how certain differences that might have seemed quite salient at one moment might later be unimportant or even related to the emergence of differences in the opposite direction. An example of such a difference would be Europe's relatively low per acre yields in the early modern period, which one might have predicted would be a major brake on growth but turned out to matter very little in the age of soaring trans-Atlantic trade and rising off-farm contributions to farm production such as petrochemical fertilizers. Since there are crucial relationships about which we still know very little—we do not know much, for instance, about likely demographic responses to changing resource constraints in either China or Europe, which makes estimates of how altering those constraints would have changed per capita growth very speculative—the value of the exercise seems to me less in trying to go far forward into any particular counterfactual world than in using a variety of them to challenge conventional ideas of "inevitable" trajectories and to eliminate or narrow hopelessly broad explanatory factors.

What surprises me most, however, is something different, which did not emerge from imagining either a radically different China or a radically different Europe in isolation but imagining an interaction of a

China and Europe that had both been more modestly altered (in line, I think, with the minimal-rewrite rule in each case, though perhaps not once we consider joint probabilities). This was the robustness of at least the First Industrial Revolution somewhere as an outcome of movements in various parts of the early modern world. In *The Great Divergence,* I emphasized that I thought Europe needed several favorable circumstances—some self-generated, some largely happenstance or conjunctural—to industrialize as it did and that we needed to take seriously the historical possibility that perhaps nobody would have industrialized; I did not think the most likely alternative was that if Europe did not somebody else clearly would have. I would still argue that with different global conjunctures European scientific and technological advances could have produced much more limited growth, which would have been neither self-sustaining nor sufficient to give Europe a truly global political hegemony. But once one grants that something new was happening in European science, and grants the importance of the same global conjunctures that I pointed to in my book (the "discovery" and depopulation of the New World, Chinese silver demand, European navigational advances, the marketization of various large economies around the world, missionaries who were also bearers of European math and science, and so on), it becomes easier than I would have imagined to picture industrialization, including the fossil fuel revolution, sprouting in at least a couple of places. And while fossil fuels and steam power alone would hardly have given us contemporary "first-world" living standards, they would probably have sufficed to change the material world more than anything else in the preceding few millennia: shattering Braudel's "biological old regime" by relaxing the food versus fuel tradeoff, allowing unprecedented speed and volume in transport and travel (and thus creating enormous changes in the division of labor and comparative advantage), making unprecedented amounts of iron and steel available, allowing enormous quantities of earth and rock to be removed or displaced, and so on.

Thus, even if less favorable resource endowments made industrialization in Europe slower and more halting, this new wave of growth was still unlikely to peter out completely like various earlier rounds of intensive growth (in which technological change was less based on applied science and new developments had been less rapidly communicated across vast spaces). So if still not persuaded that the rise of the West to global dominance was bound to happen, I am now increasingly prone to think that the emergence of sustained economic growth—one of its most

salient features—was not quite as dependent on coincidence as I had implied. Perhaps, then, the emergence of economic "modernity" somewhere (with Western scientific advances playing a key role) is more robust than the rise of the West as a geographic and political condition

NOTES

1. Readers familiar with Kenneth Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern World Economy* (Princeton: Princeton University Press, 2000) may find much of the first half of this chapter familiar; from p. 248 onward, the proportion of new material gets much larger.

2. Ibid., 36–40.

3. Ibid., 31–43, 116–52, app. F. My claims about standards of living (and various other things) were challenged in Philip Huang, "Development or Involution in Eighteenth Century Britain and China," *Journal of Asian Studies* 61, no. 2 (May 2002): 501–38, with a response from me in the same issue ("Beyond the East-West Binary: Resituating Development Paths in the Eighteenth Century World," *Journal of Asian Studies* 61, no. 2 [May 2002]: 539–90), and in a further exchange between us in the February 2003 issue 62, no. 1 (157–81). Standard of living issues are particularly emphasized in my response (175–79). A series of essays by Robert Allen comparing the Yangzi Delta and England so far also suggests comparable living standards and real wages into the late eighteenth century. See his "Agricultural Productivity and Rural Incomes in England and the Yangzi Delta c. 1620–1820," "Real Wages in Europe and Asia: A First Look at the Long-Term Patterns," and "Mr Lockyer Meets the Index Number Problem: The Standard of Living in Canton and London in 1704," all accessed on August 23, 2004, at http://www.economics.ox.ac.uk/Members/robert.allen/default.htm

4. Pomeranz, *The Great Divergence,* 124, 288.

5. This would be more appropriate in that it would allow us to compare the richest and most densely populated parts of China and Europe to each other, but I have eschewed it in order to make comparisons between areas growing similar crops and to bias the comparisons as much as possible in favor of Europe. A fuller discussion appears in ibid., chap. 5.

6. Ibid., 215–27, 303–6.

7. Ibid., 228–42, 307–12. Based on evidence I have seen more recently, I might now make these claims a bit more equivocally, but I think their basic outlines stand.

8. See generally ibid., 215–42. On timber prices, see Ernest Labrousse, *Esquisse du mouvement des prix et des revenus en France au XVIIIème siècle* (1933; reprint, Paris: Librairie Dalloz, 1984), 343, 346–47; and Li Bozhong, "Ming Qing shiqi Jiangnan de mucai wenti (The Timber Problem in Ming-Qing Jiangnan)," *Zhongguo shehui jingji shi yanjiu* 1 (1994): 86–89, 93–94. On deforestation, see Michael Williams, "Forests," in B. L. Turner et al., *The Earth as Transformed by Human Action* (Cambridge: Cambridge University Press, 1990), 181; H. C. Darby, "The Clearing of the Woodland in Europe" in *Man's Role in Changing*

the Face of the Earth, ed. B. L. Thomas (Chicago: University of Chicago Press, 1956), 203–4; and Ling Daxie, "Wo guo senlin ziyuan de bianqian (Changes in China's Forest Resources)," *Zhongguo nongshi* 3, no. 2 (1983): 34–35. On flooding, see Peter Perdue, *Exhausting the Earth: State and Peasant in Hunan, 1500–1850* (Cambridge: Harvard University Press, 1987), 196, 202, 219–33; and Anne Osborne, "The Local Politics of Land Reclamation in the Lower Yangzi Highlands," *Late Imperial China* 15, no. 1 (June 1994): 1–46. On gullying, soil degradation, and stagnant yields, see Piers Blaikie and Harold Brookfield, *Land Degradation and Society* (London and New York: Methuen, 1987), 129–140; and Mauro Ambrosoli, *The Wild and the Sown* (Cambridge: Cambridge University Press, 1997). On erosion, sandstorms, and so on, see Thorkild Kjaergaard, *The Danish Revolution, 1500–1800* (Cambridge: Cambridge University Press, 1994), 18–22.

9. For discussions of many of these problems (though with little on England), see Blaikie and Brookfield, *Land Degradation and Society,* 129–40; and Kjaergaard, *The Danish Revolution* (which, despite its title, has some good examples from beyond Denmark). For some English examples (though without any quantification), see Ambrosoli, *The Wild and the Sown,* 367, 374, 392–95, 412.

10. See, for instance, Kjaergaard, *The Danish Revolution,* 151, 158, 160.

11. Ibid., 55–56, 151–60.

12. See Kaoru Sugihara, "The European Miracle and the East Asian Miracle: Towards a New Global Economic History," *Sangyō to Keizai* 11, no. 2 (1996): 27–48; and "Agriculture and Industrialization: The Japanese Experience," in *Agriculture and Economic Growth,* ed. Peter Mathias and John Davis (Oxford: Blackwell, 1997), 148–66. For a somewhat different argument about how "premodern economic growth" as a way of dealing with ecological constraints can become self-perpetuating and make industrialization less likely, see Mark Elvin, "Blood and Statistics: Reconstructing the Population Dynamics of Late Imperial China from the Biographies of Virtuous Women in Local Gazetteers," in *Chinese Women in the Imperial Past: New Perspectives,* ed. Harriet Zurndorfer (Leiden: Brill, 1999), 135–222.

13. See, for instance, Jan DeVries, *The Economy of Europe in an Age of Crisis, 1600–1750* (New York: Cambridge University Press, 1976), 213; and Patrick K. O'Brien, "European Economic Development: The Contribution of the Periphery," *Economic History Review* 35, no. 1 (February 1982): 17.

14. See generally Pomeranz, *The Great Divergence,* 274–97, 313–15. On the specific possibility of comparable amounts of cotton coming from somewhere else or alternate fibers being used, see pages 275–78, 315.

15. It is worth noting here that it was virtually impossible to ship charcoal over long distances and still have sufficiently large chunks of it in suitable condition for iron making. See John R. Harris, *The British Iron Industry, 1700–1850* (London and New York: Macmillan, 1988), 26; and M. W. Flinn, "The Growth of the English Iron Industry, 1660–1760," *Economic History Review,* 2nd ser., 11, no. 2 (1958):150. Thus even if enough "fuel" in the abstract had still been available for a surge in iron output (thanks perhaps to economizing on other uses as the price rose), it is not clear that it could have been mobilized for this purpose.

16. Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800,* 2nd ed. (Cambridge: Cambridge University Press, 1996), 115–45. For arguments that the conquest of India—the first large and lasting victory of European arms on the Asian mainland and a condition for many that followed—was a closer call than Parker suggests, see C. A. Bayly, *Imperial Meridian: The British Empire and the World, 1780–1830* (London: Longman's, 1989). For the Americas and Siberia, the organizational, technical, and conceptual differences Parker notes are indeed striking, but whether they would have proved decisive without the epidemiological factors that inhibited "native" recovery from initial defeats is less clear. For the Southeast Asian islands and parts of the African coast, where disease did not favor the Europeans, Parker's explanation of their victories seems to me very solid, but we should remember that their mastery did not go far beyond the coast; even the interior of larger islands such as Java were often not subdued until the nineteenth century, while Mindanao held out even longer and the Dutch settlement on Taiwan fell to Chinese invaders.

17. Parker, *The Military Revolution,* 117, 145.

18. Li Bozhong, *Agricultural Development in Jiangnan, 1620–1850* (New York: St. Martin's, 1998), 108; Perdue, *Exhausting the Earth,* 56–57, 129, 132; Yamamoto Susumu, "Shindai Shikawa no chi-iki keizai (Regional Development in Qing Dynasty Sichuan)," *Shigaku Zasshi* 100, no.12 (December 1991): 7–8, 10–11, 15. For a general survey, see Pomeranz, *The Great Divergence,* 242–51.

19. I discuss the interaction among political failure, economic change, and environmental stress in Kenneth Pomeranz, "Re-thinking the Late Imperial Chinese Economy: Development, Disaggregation and Decline, circa 1730–1930," *Itinerario* 24, nos. 3–4 (December, 2000): 49–66.

20. For a more detailed version of this argument, see R. Bin Wong, *China Transformed: Historical Change and the Limits of European Experience* (Ithaca: Cornell University Press, 1997); and "The Political Economy of Agrarian China and Its Modern Legacy," in *China and Capitalism: Geneaologies of Sinological Knowledge,* ed. Timothy Brook and Gregory Blue (Cambridge: Cambridge University Press, 1999), 210–45.

21. For a fuller discussion, see Kenneth Pomeranz, "Two Worlds of Trade, Two Worlds of Empire: European State-Making and Industrialization in a Chinese Mirror," in *States and Sovereignty in the Global Economy,* ed. David Smith, Dorothy Solinger and Steven Topik (London: Routledge, 1999), 87–94; and Pomeranz, *The Great Divergence,* 189–206.

22. For quick surveys of the rise and fall of the Zheng family in historical context, see John E. Wills, "Maritime China from Wang Chih to Shih Lang: Themes in Peripheral History," in *From Ming to Ch'ing,* ed. Jonathan Spence and John Wills, 223–28 (New Haven: Yale University Press, 1979), 201–238; and John E. Wills, *Mountain of Fame: Portraits in Chinese History* (Princeton: Princeton University Press, 1994).

23. Jennifer Cushman, "Duke Ch'ing-fu Deliberates: A Mid-Eighteenth-Century Reassessment of Sino-Nanyang Commercial Relations," *Papers on Far Eastern History* 17 (March 1978): 137–56; Wang Gungwu, "Merchants without Empire," in *The Rise of Merchant Empires,* ed. James Tracy (Cambridge: Cambridge University Press, 1990), 400–421.

24. For relevant accounts of the logic of imperial Chinese political economy

see Wong, *China Transformed,* 105–51; and "The Political Economy of Agrarian China and Its Modern Legacy."

25. Pomeranz, *The Great Divergence,* 120–122, 204–5.

26. Leonard Blussé, "Batavia, 1619–1740: The Rise and Fall of a Chinese Colonial Town," *Journal of Southeast Asian Studies* 12, no. 1 (March 1981): 159–78; Wang Gungwu, "Merchants without Empire"; Rafael Bernal, "The Chinese Colony in Manila, 1570–1770," in *The Chinese in the Philippines, 1570–1770,* ed. Alfonso Felix (Manila: Solidaridad, 1966), 40–66.

27. Blussé, "Batavia"; and Leonard Blussé, *Strange Company: Chinese Settlers, Mestizo Women, and the Dutch in VOC Batavia* (Dordrecht: Foris, 1986).

28. Victor Lieberman, *Strange Parallels: Southeast Asia in a Global Context, c. 800–1830,* vol. 1: *Integration on the Mainland* (Cambridge: Cambridge University Press, 2003), esp. 31–37, 44, 54.

29. Vaclav Smil, *Biomass Energies* (New York: Plenum, 1983), 36; E. Anthony Wrigley, *Continuity, Chance, and Change: The Character of the Industrial Revolution in England* (Cambridge: Cambridge University Press, 1988), 54–55.

30. M. W. Flinn, *The History of The British Coal Industry,* vol. 2: *1700–1830: The Industrial Revolution* (Oxford: Clarendon, 1984), 26, 121–28; B. R. Mitchell, *British Historical Statistics* (New York: Cambridge University Press, 1988), 247.

31. Li, "Ming Qing Jiangnan de mucai wenti," 86–89, 93–94; Li Bozhong, *Agricultural Development,* 4, 200, n. 23; Pomeranz, *The Great Divergence,* 225–29. See also William Rowe, *Hankow: Commerce and Society in a Chinese City, 1796–1889* (Stanford: Stanford University Press, 1984), 58–59, 61, 269–73, on the enormous timber trade passing through Hankou, much of it on its way to the Lower Yangzi.

32. Sun Jingzhi, *Economic Geography of China* (New York: Oxford University Press, 1988), 93.

33. See, for instance, Huang Qichen, *Zhongguo gangtie shengchan shi, shisi—shiqi shiji* (A History of Chinese Iron and Steel Production, Fourteenth to Seventeenth Centuries) (Zhengzhou: Zhongzhou guji chubanshe, 1989), 70–72, for a seventeenth-century list.

34. Ibid.,109–40.

35. G. William Skinner, "Regional Urbanization in Nineteenth Century China," in *The City in Late Imperial China,* ed. G. William Skinner, 211–49 (Stanford: Stanford University Press, 1977), 217.

36. Jan DeVries and Ad van der Woude, *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500–1815* (Cambridge: Cambridge University Press, 1997), 37.

37. Li Bozhong, *Jiangnan de zaoqi gongyehua* [Proto-industrialization in Jiangnan] (Beijing: Shehui kexue chubanshe, 2000).

38. See Joseph Needham (with assistance from Wang Ling), "Physics and Physical Technology," vol. 4, pt. 2 (sec. 27 overall) of Joseph Needham et. al., *Science and Civilization in China* (Cambridge: Cambridge University Press, 1965), 513–15, 522, 525–28, 531 (mentioning seventeenth-century clocks an inch across, which required very fine work and clock makers who could copy the finest of Western imports); see also pages 285 and 296 on odometers with differential gears as early as the eleventh century.

39. See Skinner, "Regional Urbanization," 217, on transport costs. See also Tim Wright, *Coal Mining in China's Economy and Society, 1895–1937* (Cambridge: Cambridge University Press, 1984), 9, citing a quintupling of the price of coal in northwest China between the mine and the riverbank fifty kilometers away. Cf. also DeVries and Van der Woude, *The First Modern Economy,* 37, on Europe: "Historically, the exploitation of energy deposits has depended more on the costs of transportation than on the costs of gathering the resource itself."

40. Sun Yingxing, *Tian Kong Kai Wu* (1637) juan 11, cited in Yu Mingxia, *Xuzhou Meikuang shi* (A History of the Xuzhou Coal Mines) (Nanjing: Jiangsu guji chubanshe, 1991), 23. Water appears to have been a lesser problem, even at the Xuzhou mines, which were in a much wetter area than Northwest China (27).

41. On steam engines elsewhere, see Needham, "Physics and Physical Technology," 255. On fuel consumption, costs, and the distribution of steam engines in England circa 1800, see Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (New York: Oxford University Press, 1990), 88, 90. I make this argument at greater length in Pomeranz, *The Great Divergence,* 59–60, 67–68.

42. Yu, *Xuzhou Meikuang shi,* 27.

43. Ibid., 21.

44. See Xu Dixin and Wu Chengming, *The Development of Capitalism in China, 1522–1840* (New York: St. Martin's, 2000), 289–307.

45. At least that is the standard view; a work in progress by Roger Hart questions whether the knowledge in question, mostly having to do with how to solve systems of equations, including higher-order polynomials, was ever really lost.

46. Ellen Widmer, "The Huanduzhai of Hangzhou and Suzhou: A Study in Seventeenth Century Publishing," *Harvard Journal of Asiatic Studies* 56, no. 1 (1996): 95–115; Xiong Pingzhen, *Yuyu: Chuantong Zhongguo de qiangpao zhidao* (Caring for the Young: The Newborn's Way in Traditional China) (Taibei: Lianjing, 1995); Paul Unschuld, *Medicine in China: A History of Pharmaceutics* (Berkeley: University of California Press, 1986), 183–97.

47. Benjamin Elman, *From Philosophy to Philology: Intellectual and Social Aspects of Change in Late Imperial China* (Cambridge: Harvard University Press, 1990), 79–85; John Henderson, *The Development and Decline of Chinese Cosmology* (New York: Columbia University Press, 1984), 153–68; Kawata Tei'ichi, "Shindai gakujutsu no ichi sokumin (Sidelights on Scholarship in the Qing Period)," *Tōhōgaku* 57 (1979): 84–105.

48. Mark Elvin, "The Man Who Saw Dragons: Science and Styles of Thinking in Xie Zhaozhe's *Fivefold Miscellany,*" *Journal of the Oriental Society of Australia* 25–26 (1994): 40.

49. Elvin (ibid., 21–22) compares this to the emergence of such a network in seventeenth-century Europe, relying on the work of Barbara Shapiro.

50. Ibid., 22, citing Alastair Crombie.

51. Elman, *From Philosophy to Philology,* 174–75.

52. Ibid., 199, 204–5.

53. Ibid., 181–84.

54. Ibid., 221–22.

55. Ibid., 216–29.

56. See, for instance, ibid., 216, 228–29.

57. Cited in Helen Dunstan, "Official Thinking on Environmental Issues and the State's Environmental Roles in Eighteenth Century China," in, *Sediments of Time: Environment and Society in Chinese History,* ed. Mark Elvin and Liu Ts'ui-jung (Cambridge: Cambridge University Press, 1997), 606–8. See also Robert Marks, "It Never Used to Snow: Climatic Variability and Harvest Yields in Late-Imperial South China, 1650–1850," in Elvin and Liu, *Sediments of Time,* 411–12, on Kangxi; Robert Marks, *Tigers, Rice, Silk, and Silt: Environment and Economy in Late Imperial South China* (Cambridge University Press, 1997), 331–32, 343, 345, on Deng Bi'nan; and Anne Osborne, "The Local Politics of Land Reclamation."

58. Cf. Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens, and the Origins of Environmentalism, 1600–1800* (Cambridge: Cambridge University Press, 1995), 153–67, 264–428.

59. Ibid., 309–79; H. H. Lamb, *Climate, History, and the Modern World* (London and New York: Methuen, 1982), 235–36.

60. See the discussion of these memorials in James Lee, Cameron Campbell, and Guofu Tan, "Infanticide and Family Planning in Late Imperial China: The Price and Population History of Rural Liaoning, 1774–1873," in *Chinese History in Economic Perspective,* ed. Lillian Li and Thomas Rawski (Berkeley: University of California Press, 1992), 159–63.

61. For an overview of the situation, see Osborne, "The Local Politics of Land Reclamation," 14–36.

62. Margaret Jacob, *The Cultural Meaning of the Scientific Revolution* (New York: Knopf, 1988), 239–43.

63. See, for instance, Toby E. Huff, *The Rise of Early Modern Science: Islam, China, and the West* (Cambridge: Cambridge University Press, 1993), 237–320, which relies heavily on the work of Derk Bodde, particularly with respect to the role of Chinese law. But Bodde's last formulation of at least part of this relationship (*Chinese Thought, Science, and Society* [Honolulu: University of Hawaii Press, 1991], 332–45) seems to me more ambivalent than it is in Huff's reading. See also Joseph Needham, "History of Scientific Thought," in Joseph Needham, et. al., *Science and Civilization in China,* vol. 2 (Cambridge: Cambridge University Press, 1956), 518–83.

64. There is also a parallel set of arguments with regard to India.

65. Needham, "Physics and Physical Technology," 135–36, 225–26, 285, 296, 369–70, 387.

66. In imagining this scenario, it should be noted, I am no longer asking questions that invite comparison with Mokyr's analysis in chapter 10 of this volume. He treats the rise of the West as an all or nothing phenomenon and asks whether, in the absence of the scientific and technological achievements made in Europe after 1550, any other place is likely to have duplicated this trajectory. In part because the late sixteenth century was a period of relatively strong Sino-Western contact and in part because I do not think the West had clearly overtaken China economically until at least the late eighteenth century, I am here imagining scenarios in which the Western economic trajectory stalled circa 1750 or proceeded, though more slowly—and with a sufficiently smaller and later growth of heavy industry to diminish Europe's military and political predominance during the nineteenth century, at least vis—vis East Asia—to see what might have happened to East Asia's own development in such a situation.

67. Michael Greenberg, *British Trade and the Opening of China* (Oxford University Press, 1951), 89–92; Robert Marks, "Maritime Trade and the Agro-Ecology of South China," in *Pacific Centuries: Pacific and Pacific Rim History since the Sixteenth Century,* ed. Dennis O. Flynn, Lionel Frost, and A. J. H. Latham (London: Routledge, 1999), 94–97.

68. Wilt Idema, "Cannons, Clocks, and Clever Monkeys: Europeana, Europeans, and Europe in Some Early Ch'ing Novels," in *The Development and Decline of Fukien Province in the 17th and 18th Centuries,* ed. Eduard Vermeer, 467–69 (Leiden: Brill, 1990); Needham, "Physics and Physical Technology," 513–15, 522, 525–28, 531.

69. Nathan Sivin, "Science and Medicine in Chinese History," in *Heritage of China,* ed. Paul Ropp (Berkeley: University of California Press, 1990), 192–93; Joanna Waley-Cohen, *The Sextants of Beijing: Global Currents in Chinese History* (New York: Norton, 1999), 107–12.

70. R. Bin Wong, "The Search for European Differences and Domination in the Early Modern World," *American Historical Review* 107, no. 2 (April 2002): 459–61. On Chinese interest in Western weapons before the Opium War, see Waley-Cohen, *The Sextants of Beijing,* 118–22.

71. Robert Dernberger, "The Role of the Foreigner in China's Economic Development, 1840–1949," in *China's Modern Economy in Historical Perspective,* ed. Dwight Perkins (Stanford: Stanford University Press, 1975), 19–47; and John K. Fairbank, "Introduction: the Old Order," in *The Cambridge History of China,* vol. 10, pt. 1: *Late Ch'ing, 1800–1911,* ed. John K. Fairbank, 1–34 (Cambridge: Cambridge University Press, 1978), 5–6, 19, are examples of this position in respected mainstream Western scholarship. Joseph Esherick, "Harvard on China: The Apologetics of Imperialism," *Bulletin of Concerned Asian Scholars* 4, no. 4 (1972): 9–16, is a scathing critique of this position, tracing its roots back to apologists for the Opium War itself. Hou Wailu, *Zhongguo fengjian shehui shi lun* (Essays on the History of Chinese Feudal Society) (Beijing: Renmin chuban-she, 1979), is a classic example of Chinese Marxist scholarship that (ironically) leads to a similar conclusion about the necessity of an outside force to destroy "feudalism" in China. Paul Smith, "Introduction: Problematizing the Song-Yuan-Ming Transition," in *The Song-Yuan-Ming Transition,* ed. Paul Smith and Richard Von Glahn (Cambridge: Harvard University Press, 2003), 1–34, esp. 2–7, provides a very helpful survey of the entire idea of an "early modernity" in Song China followed by stagnation, tracing it through Chinese, Japanese, and Western variants.

72. See, for some of the many examples, Kawakatsu Heita, *Nihon bunmei to kindai seiyō: "Sakoku" saikō* (Japanese Civilization and the Modern West: "Sakoku" Reconsidered) (Tokyo: Nippon Hōsō Shuppan Kōykai, 1991); Sugihara, "The European Miracle and the East Asian Miracle"; Sugihara, "Agriculture and Industrialization"; Hayami Akira, "Kinsei Nihon no keizai hatten to