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# **Provincializing the First Industrial Revolution**

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## Provincializing the First Industrial Revolution \*

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'Il n'y a pas d'histoire, il y a une histoire du monde' (Marc Bloch as cited by Andre Gunder Frank, *ReOrient: Global Economy in the Asian Age* (Berkeley: University of California Press, 1998)).

Andre agreed with little I wrote, but I offer this essay to commemorate an intellectual of extraordinary erudition and rare courage.

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### 1. Representations of The First Industrial Revolution

In 1967 Marshal Hodgson (the godfather of global economic history) wrote these percipient words: "Without the cumulative history of the whole Afro-Asian Oikumene of which the Occident had been an integral part, the western transmutation would be almost unthinkable".<sup>1</sup> Alas, the recommendation by this eminent scholar of Islam to re-conceptualize what his essay refers to as "The Great Western Transmutation" within the wider spaces, longer chronologies and cultural frameworks of the long and interconnected history of Afro-Eurasia was not taken forward until Eric Jones published the first edition of the *European Miracle* in 1981.<sup>2</sup> Since then slowly but surely the bibliography of books, articles and debates relocating and reconfiguring the

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\* My thanks to my friends Bob Allen, Larry Epstein and Giorgio Riello for their helpful suggestions for improvement and the GEHN network for education.

<sup>1</sup> M. Hodgson, *Rethinking World History. Essays on Europe, Islam and World History* (Cambridge: Cambridge University Press, 2002) 68.

<sup>2</sup> E. Jones, *The European Miracle. Environments, Economics and Geopolitics in the History of Europe and Asia* (Cambridge: Cambridge University Press 1981).

industrialization of the west as a conjuncture in global economic history has proliferated and matured into a field that, along with accelerated trends towards a globalized economy is revitalizing interest in our subject across the humanities and social sciences. It seems timely to make an attempt to follow Marshall Hodgson's lead and attempt to "reconfigure" Britain's famous industrial revolution.

This internationally renowned episode in Hanoverian history is certainly the first and the most famous example of industrialization on record. As an initial and celebrated case generations of scholars have, however, exaggerated its Britishness (or even its Englishness), elevated its historiographical status and above all misrepresented and reified what is a less than remarkable conjuncture in the economic history of an Island realm into a (if not to the) paradigm case for liberal and neo-liberal models of economic development.

Industrialization is certainly an important historical process, drawn out or truncated in time which has occurred in local, regional, national, continental and global contexts. While it involves social, cultural, political and geopolitical forces, its outcome can be parsimoniously encapsulated in statistical form as a conjuncture of economic transformation from an agrarian to an industrial economy.<sup>3</sup> Following Kuznets, in quantitative terms what economic historians have observed and measured is "structural change", proceeding more or less rapidly until the majority of a national workforce ceases to be closely linked with primary products and becomes employed either directly (or indirectly through related activities such as trade, transportation, finance, information, consultancy, protection, welfare and other services) with the production and servicing of manufactured goods. Statistically the trend towards an industrial market economy can be tracked with reference to data displaying shares

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<sup>3</sup> Patrick O'Brien, ed., *Industrialization critical perspectives on the world economy*, 4 vols (London: Routledge, 1998), 4.

of workforces, employed in industry and related services and with difficulty in imperfect tabulations of national accounts, spanning long chronologies of time displaying shares of gross domestic products labelled as industrial outputs.

Although claims have been made for the Netherlands to be recognized as “the First Modern Economy”, nobody disputes that Great Britain became the first national economy to complete a transition to an industrial economy.<sup>4</sup> For more than two centuries the realm’s famous transformation has been narrated and explained under such labels as *The First Industrial Revolution*, *the First Industrial Nation* or simply as *The Industrial Revolution*. Anglo-American historians have analysed the decades and cycles of rapid development in British economic history for a range of sub periods running from the mid-18<sup>th</sup> through to the mid-19<sup>th</sup> centuries; represented them in such metaphorical terms such as: watershed, great divergence, turning point and take-off and published claims that The British Industrial Revolution was a more pervasive and universal achievement, than say the Florentine Renaissance, or the French Revolution.<sup>5</sup> Almost from its inception the Industrial Revolution has been represented not only as a profound discontinuity for the history of the Hanoverian kingdom, but also as a conjuncture of trans-national significance for the future of the world economy, which positioned and periodized European, American, Asian and African histories into a “before” and “after” The Industrial Revolution.<sup>6</sup>

Although nothing approximating to a “paradigm” for industrialization (which rescued first Britons, and over time growing proportions of

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<sup>4</sup> J. De Vries and A. Van Der Woude, *First Modern Economy. Success, Failure and Perseverance of the Dutch Economy 1500-1815* (Cambridge: Cambridge University Press, 1997).

<sup>5</sup> P. Mathias and J.A. Davis, eds., *The First Industrial Revolutions* (Oxford: Blackwells, 1989): 1-24.

<sup>6</sup> J. Goldstone, “Efflorescences and Economic Growth in World History: Rethinking the “Rise of the West” and the Industrial Revolution,” *J. World Hist.* 13 (2002), 323-92.

mankind from the millennial afflictions of poverty, malnutrition, disease and early death) endemic to existence in agrarian societies was either initially constructed or fully developed during seven decades in the economic history of a small island located off the coast of Europe, there is no need to derogate the precocious range of innovatory economic achievements that came on stream over the century which succeeded Britain's decisive victory in the Seven Years War 1756-63. Defined historically as *the* century which marked discernible and irreversible accelerations *in the rates of increase* of real income per head, in shares of the increment both to rates of growth in income per capita and labour productivity emanating from technical and structural changes, and urbanization, it seems merely polemical to engage in semantic attempts designed to *purge* the label Industrial Revolution from academic discourse and public consciousness.<sup>7</sup> Considered, as Hodgson advised, in a long stream of world history, on all the indicators, that economic historians have constructed since the publication of Ashton's classic study in 1948, the transformation (although discernibly slow by subsequent standards) became rapid enough to carry the national economy forward to the position of competitive superiority that the kingdom enjoyed in relation to all other European, American and Asian economies during the Victorian boom (1846-73).<sup>8</sup>

Britain's naval and commercial hegemony (as well as the efficiency of its agriculture) had been widely recognized before the second half of the 18<sup>th</sup> century.<sup>9</sup> Thereafter, and as its industries matured, the rest of the world paid deference to clear comparative advantages exemplified by

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<sup>7</sup> R. Cameron, "The Industrial Revolution Fact or Fiction" in François Crouzet and Armand Clesse, eds., *Leading the World Economically* (Amsterdam: Dutch University Press, 2003), 169-184; and J. Moyr's comments, pp.357-59

<sup>8</sup> N. Crafts and K. Harley, "Output Growth and the British Industrial Revolution: A Restatement of the Crafts-Harley view," *Econ.Hist.Rev.* 45 (1992), 703-30.

<sup>9</sup> P. Langford, "The English as Reformers. Foreign Visitors' Impressions 1750-1850," in T. Charles et al, eds., *Reforms in Great Britain and Germany 1750-1850* (Oxford: Oxford University Press, 1999) 101-19.

several sectors of British manufacturing while retaining strong reservations about the social and political consequences of the nation's pattern of urbanization and structural change. Thus a plethora of well-calibrated data (complemented by a bibliography of impressions recorded by visitors from the mainland and the United States) justifies the representation of the accelerated transformations that came on stream after the Seven Years War as The First Industrial Revolution.<sup>10</sup> After all that century of British history witnessed the development of novel techniques of production; the construction of engines to harness a new and potentially hegemonic source of energy (steam), the extension of improved modes of internal transportation (canals, turnpikes and railways) the diffusion of efficient forms of business and commercial organization, the spread of responsive systems of financial intermediation and distribution; the closer integration of commodity and factor markets. All this occurred at a pace and upon a scale that ex post looks extraordinary, if not revolutionary for its time and location.<sup>11</sup>

Yet as they become more global and cosmopolitan in their outlook, historians of the First Industrial Revolution are less inclined to ignore not merely its European, but its Chinese, Indian and African antecedents. Modern interpretations are now unlikely to exaggerate elements in British political institutions, social structure, and culture that not long ago formed the foundations of explanations for the nation's precocious, relative and short lived economic success. Only a few Whig historians and economists continue to reify core features and factors behind Britain's peculiar transition towards the first industrial market economy into a paradigm of advanced technologies, optimal institutions and progressive cultural traits

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<sup>10</sup> G. Riello and P. O'Brien, "Reconstructing the Industrial Revolution: Analyses, Perceptions and Conceptions of Britain's Precocious Transition to Europe's First Industrial Society," Department of Economic History Working Paper in *Economic History* 84 (2004), 1-41.

<sup>11</sup> R. Floud and P. Johnson, eds., *The Cambridge Economic History of Modern Britain*, Vol 1 Industrialization 1700-1860 (Cambridge: Cambridge University Press, 2004).

for enterprise and innovation that could be readily transferred to rival but retarded economies on the mainland, which became rational enough to adopt best practice (i.e. British) technologies, modes of economic organization and institutional frameworks for production.<sup>12</sup>

In short, a modern wave of historical scholarship has been concerned to educate students to become aware of the European, Asian and Imperial dimensions of the British Industrial Revolution; and to observe the rather rapid convergence of Western economies to comparable levels of per capita income and labour productivity in terms of the peculiarities of each national case and theories of path dependency. Diffusion models which, in effect, elevated the status of Britain's precocious transition to a paradigm case are no longer regarded as an illuminating way to comprehend the industrialization of mainland Europe, the United States and East Asia let alone as a basis for policy recommendations to countries still struggling to industrialize. They have been degraded into consoling but simplistic narratives purveyed by nationalistic communicators of British exceptionalism.<sup>13</sup>

Narrated, interpreted and contextualized as a conjuncture formed by the ebb and flow of global history, the historicized status and heuristic potential for the First Industrial Revolution breaks down, into a range of innovations of world significance (e.g. the steam engines of Newcomen and Watt, Corts' path breaking technique for puddling iron, the weaving machines of Kay and Cartwright), which can be represented as more or less novel and indigenous to the Islands. Other achievements of the period, such as the invention of roller spinning by the son of a Huguenot refugee; Wedgwood's "China" made in the Potteries, painted by young

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<sup>12</sup> Among them are: D. Landes, *The Wealth and Poverty of Nations: Why some are so rich and some so poor* (New York, Little Brown, 1998) and D. North, *Institutions, Institutional Change and Economic Performance* (Cambridge, Cambridge University Press, 1990).

<sup>13</sup> Hodgson, *Rethinking World History*, part 1 and C. Rider and M. Thompson, eds., *The Industrial Revolution in Comparative Perspective* (Malabar, Fla. 2002).



women born in Staffordshire, but in colours and designs derived from Classical Greece; or the techniques used to manufacture, bleach, dye, and print cotton cloth made in Lancashire from organic raw materials cultivated on slave plantations and finished from knowledge and skills brought to high levels of perfection, in India, the Ottoman dominions, Sweden and France are no longer acclaimed as peculiarly “English”.<sup>14</sup> Economic history has matured into a cosmopolitan subject and it now seems futile to separate out “indigenous” from “foreign” components embodied in the myriad of manufactured goods produced in England during the reign of George III.<sup>15</sup>

Fortunately, the last thirty years of research has allowed us to escape from nationalism, the tyranny of detail and to model, to amalgamate, to aggregate and to assign conjectural, but plausible, weights to *major* forces behind the accelerated growth of Britain’s per capita output and labour productivity from 1763 to 1860.<sup>16</sup> Causes or origins accorded significance that now appear in reconfigurations of The First Industrial Revolution include: the kingdom’s highly productive and responsive agriculture; its abundant and accessible supplies of minerals, particularly coal; foreign trade, promoted and sustained by massive and cost effective state investment in naval power, and, last but not least, (in the context of models designed to “measure” the significance of proximate determinants) technological discovery and innovation. As usual, emphases accorded to interrelated forces behind any macro and complex conjuncture in history never settle into a consensus, but these factors (if not their ordering or their weights) are widely accepted as major

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<sup>14</sup> I. Inkster, *Technology and Industrialization* (Aldershot: Variorum Press, 1998), 40-58.

<sup>15</sup> M. Berg, *Luxury and Pleasure* (Oxford: Oxford University Press, 2005).

<sup>16</sup> N. Crafts, “Productivity Growth in the Industrial Revolution: a New Growth Accounting Perspective,” *J.Econ.Hist.* 64 (2004), 521-35.

causes among economic historians.<sup>17</sup> Indeed, (and as I will suggest), it may now prove possible to paint Britain's famous transition as a "conjuncture" in the long run global history of material progress that came on stream when and where it did in large measure as the outcome of favourable national endowments (including location) and massive investments by the state in naval power. Within the golden triangle of that painting, the First Industrial Revolution can be perceived and conceived as a case of precocious and exceptional industrialization, and as an island story told largely in geographical and geopolitical terms.

## **2. Natural Endowments and the Institutions for their Exploitation**

For centuries before 1756, the British Isles had been blessed with a geography and an agricultural sector functional for structural change - exemplified by very good (but not extraordinary) yields per arable hectare cultivated and, above all, compared with other parts of Europe and particularly with India and China, high levels of output per worker.<sup>18</sup> But apart from the Isle's favourable soils and climates from where did these prior but basic advantages in agriculture emanate? Supporters of the traditional Anglocentric view insist that a rather distinctive set of property rights and tenurial arrangements for access to land had appeared earlier on the Isles than on the mainland of Eurasia. Over centuries of time the evolution of this English system of property rights promoted: the formation of large scale units of production, flexible markets for tenure, a concentration of rents from the ownership of natural resources and above all a steady reduction in the extent and control by peasant families over

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<sup>17</sup> M.J. Daunt, *Progress and Poverty. An Economic and Social History of Britain 1750-1850* (Oxford: Oxford University Press, 1995).

<sup>18</sup> B. Van Bavel and E. Thoen, eds., *Land Productivity and Agro Systems in the North Seas Area, Middle Ages – 19<sup>th</sup> century. Elements for Comparison* (Turnhout: Corn Publications, 1999).

both land and labour: the former potentially available for release as larger scale enclosable farms and the latter for employment initially as waged workers to capitalist farmers, and later on, when demands emerged for proto industrial and urban work.<sup>19</sup> Among those following Arthur Young's inclinations to represent the kingdom's aristocracy and gentry as distinctively entrepreneurial, there has been an implicit celebration of unequal landownership as a benign outcome of market forces that promoted investment, cultures of improvement and the accumulation of capacities for efficient estate management embodied among those of noble birth who had acquired, by way of predation and inheritance, as well as purchase, ever larger shares of the nation's natural resources.<sup>20</sup>

Markets are recommended by economists as rational institutions for the transfer of property rights to land, forests and minerals into the private ownership and/or control of those who can manage their use for purposes of production most effectively. The system of agrarian property rights (already in place well before the times of the First Industrial Revolution) embodied advantages for the realm's precocious transition to an industrial economy which included the outstanding capacities of British agriculture to release ("expel") labour to other sectors of the economy. Nevertheless there can be no presumption that their emergence in medieval times and the linear evolution thereafter of markets for the sale and purchase of land and of contractual rules for rights of access to land proceeded solely (or even mainly) as an efficient outcome of English individualism or from the extension of markets.<sup>21</sup> Political and legal histories of the frameworks surrounding property and tenurial rights to the Island's endowments of natural resources reveal that they also emanated

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<sup>19</sup> M. Prak, ed., *Early Modern Capitalism. Economic and Social Change in Europe* (London: Routledge, 2001).

<sup>20</sup> R. Allen, *Enclosure and the Yeoman* (Oxford: Oxford University Press, 1992).

<sup>21</sup> A. Macfarlane, *The Origins of English Individualism* (Oxford: Oxford University Press, 1979) and R. Britnell, *The Commercialisation of English Society 1000-1500* (Cambridge: Cambridge University Press, 1993).

from far less “benign” historical forces which included conquest, internal colonization, the violent expropriation of ecclesiastical and common land, the systematic accumulation of power by closed aristocratic elites which, over time severely attenuated rights of access to the Island’s cultivable land, forests and minerals by smaller freeholders and peasant families.<sup>22</sup> A “push” from above coupled with an intensifying “pull” from high wages potentially available to migrants from the countryside to London and other maritime cities, engaged with realizing gains from trade and specialization, provided Britain with exceptionally flexible markets for labour for centuries before urban industry demanded a rapidly increasing share of the nation’s workforce.<sup>23</sup>

However they view the long term evolution towards a rather distinctive and inegalitarian system of property rights, most economic historians are now inclined to agree that over time powerful elites pushed agriculture in directions conducive to the attainment of higher levels of labour productivity and away from the disadvantages for rapid industrialization and urbanization associated with peasant proprietorial relationships and household units for production that survived on the mainland and remained omnipresent across south and east Asian societies.<sup>24</sup>

Nevertheless, more reductionist accounts of the island’s advantages for an early transition were recognized by physiocratic improvers who visited England in the eighteenth century. Although they lauded its distinctive set of tenurial institutions, coupled with concentrated land ownership and aristocratic management of large estates, most insisted on the primacy of geography. Their perceptions that the Island’s

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<sup>22</sup> T. Scott, ed., *The Peasantries of Europe from the Fourteenth to the Eighteenth Centuries* (London: Longman, 1998).

<sup>23</sup> R. Allen, “The Great Divergence in European Wages from the Middle Ages to the First World War,” *Explorations in Econ.Hist.* 38 (2001), 411-47.

<sup>24</sup> K. Pomeranz, “Beyond the East-West Binary. Resituating Development Paths in the Eighteenth Century World, *J.Asian.Stud.* 61 (2002), 539-90.

favourable environmental endowments (particularly grass) had encouraged the steady accumulation of sheep, cattle, pigs and above all horses is now commonplace in agrarian history.<sup>25</sup> By the Civil War the kingdom's large population of animals provided the high value outputs, extra supplies of energy and flows of organic fertiliser that had carried English agriculture to the head of European league tables and up onto a plateau from where the primary sector could (with increasing help from colonized Irish land and labour) lend support to accelerated population growth, proto-industrialization and extensive urbanization. Geography not only matters more than institutions, it goes a long way towards explanations for their form and evolution.

Wrigley has brought back into the foreground of the First Industrial Revolution, another and equally significant natural advantage that Britain derived from easy access by waterborne transportation to abundant supplies of cheap inorganic energy in the form of coal.<sup>26</sup> True, its European competitors, particularly Belgium, Germany, (even France and China) also possessed subterranean forests, but not of the same quality, nor nearly as cheap to transport to coastal cities. Britain began and completed the transition from organic to inorganic (mineral) sources of energy several decades before the rest of Europe.<sup>27</sup> By the early 19<sup>th</sup> century, households and firms consumed around 15 million tons of coal a year compared to 3 million tons for Europe as a whole. Estimates for tons of coal mined in China are not available but for reasons that are not clear, the large-scale deposits in the Northern provinces of the Qing Empire

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<sup>25</sup> P. O'Brien and D. Heath, "English and French Landowners 1688-1789," in F. Thompson, ed., *Landowners, Capitalists and Entrepreneurs* (Oxford: Oxford University Press, 1994), 23-62.

<sup>26</sup> A. Wrigley, *Continuity, Chance and Change: The Character of the Industrial Revolution in England* (Cambridge: Cambridge University Press, 1988).

<sup>27</sup> A. Wrigley, "The Divergence of England: The Growth of the English Economy in the Seventeenth and Eighteenth Centuries," *Trans.Royal.Hist.Soc.* 10 (2000), 117-41.

remained underground until well into the 20th century?<sup>28</sup> Mainland European and East Asian economies and cities found substitutes such as peat, wood, water, wind and human energy but the advantages for earlier industrialization of using the cheaper and more efficient thermal form of energy turned out to be substantial. For example, wind and waterpower is less reliable and predictable. Coal replaced the land, used to feed horses and oxen as well as the manpower employed in forestry. As a substitute for wood fuel, coal allowed more land and other resources to be devoted to growing food and agrarian raw materials. Given that the energy from a ton of coal equals the energy from two tons of timber and an acre of land produces two tons of dry wood, Britain's coal output for 1815 implies that 15 million acres (equivalent to 88% of the arable area) had counterfactually by then been released from forestry to grow grains, vegetables, animal products and industrial raw materials.<sup>29</sup>

Heat intensive industrial processes in metallurgy, glass making, brewing, refining sugar and salt, chemistry, in baking food and bricks etc. could all be conducted more efficiently with cheap coal. The feedbacks and technological spin-offs from these industries to metallurgy and to the making of kiln's, pots, vats and containers also turned out to be important for industrial development. Cheaper fuel which kept workers warmer at home and work diminished their needs for calories in order to generate greater human efforts required for production. While lower cost bricks and metals for the construction of houses in cities, towns and industrial villages, saved capital which could be invested in social overhead facilities and in industry itself.

For organic systems of production, energy accounts constitute a heuristic and illuminating complement to national income accounts for the

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<sup>28</sup> I. Inkster and P. O'Brien, eds., "The Global History of the Steam Engine," *History of Technology* 25 (2004) special issue on the steam engine.

<sup>29</sup> R.P. Sieferle, *The Subterranean Forest. Energy Systems and the Industrial Revolution* (Cambridge: Cambridge University Press, 2001).

analysis of transitions to modern systems of production requiring diversified sources of energy. At a time when technological progress which augmented labour productivity remained slow and confined to a few sectors of industry, countries favourably endowed with fertile land, minerals, natural waterways and above all with a cheaper fuel linked to a maturing but leading network technology (steam power), enjoyed a head start in the “leap forward” to become industrial market economies.<sup>30</sup>

### **3. The Nature and Economic Significance of Britain’s Maritime Strategy for Security with Development**

Debate about the precise nature and significance of foreign trade for The British Industrial Revolution is unresolved. Views on that connexion range all the way from “trivial and dispensable” to “necessary and sufficient”.<sup>31</sup> Contemporary perceptions and histories which maintained that commerce overseas could through all kinds of mechanisms (not captured within a modern and statistical framework based upon national accounts) have been a significant component of British industrialization are being restored as valid. For comparative economic history, they probably represent the most significant of Marc Bloch’s salient contrasts between Britain and its economic rivals.<sup>32</sup>

Over the eighteenth century the volume of British made commodities sold overseas multiplied four times, compared to a multiplier of over just two, between 1500 and 1700. Ratios of exports to gross national product increased from little over 4% in the reign of Elizabeth, to 6% after the Restoration, up to 8% at the Glorious Revolution, and the

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<sup>30</sup> V. Smil., *Energy in World History* (Boulder: Westview Press, 1994).

<sup>31</sup> J. Mokyr, ed., *The British Industrial Revolution* (Oxford: Oxford University Press, 1993).

<sup>32</sup> J. Cuenca-Esterban, “The Rising Share of British Industrial Exports in Industrial Output,” *J.Econ.Hist.* 57 (1997), 879-906.

quotient reached 12% in the reign of George III. At least half of the increment to industrial production which came on stream over a long 18<sup>th</sup> century (1688-1815) was sold overseas. Shares of the outputs exported of the most rapidly growing and technically progressive of British industries (cottons, woollens, metals, shipbuilding) became outstanding. For the development of a British economy led by modernizing industries, the nation's multi-faceted involvement with the world economy has now emerged as an unmistakeably significant precondition for the growth with structural change and diversification, that took place before and during the Industrial Revolution. Already by the close of the Seven Years War, something like half of the nation's workforce (de-linked from agriculture) depended directly and indirectly on markets overseas for its livelihood. Revenues from exports exchanged for strategic materials (pitch, tar, hemp, timber, bar iron) vital for the naval defence of a mercantilist realm; as well as taxable tropical foodstuffs such as sugar, tea, coffee and spices and fibres for the rapidly growing cotton, and the linen and silk industries.<sup>33</sup> Over the period 1790 to 1820 net imports of farm produce (foodstuffs and organic raw materials) rose from around 20% to 40% of domestic farm output. As *pôles de croissance* (London, Bristol, Hull, Glasgow, Newcastle, Liverpool, and other maritime cities) provided the infrastructures, skilled workforces and internal transportation and distribution networks to service internal as well as overseas trade. Their high wages attracted labour from the countryside. Cities and their hinterlands integrated into productive fiscal bases for the states rapacious demand for customs and excise duties, allocated to build up the naval power, deployed to defend British markets, colonial territories and assets overseas. Alas, we do not have estimates for the total values of

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<sup>33</sup> P. O'Brien and S. Engerman, "Exports and the Growth of the British Economy from the Glorious Revolution to the Peace of Amiens," in B. Solow, ed., *Slavery and the Rise of the Atlantic System* (Cambridge: Cambridge University Press, 1991), 117-210.



commodities and services, exchanged across the world's frontiers between 1660 and 1846, but few historians would disagree that Britain (not France, Portugal, Spain, the Netherlands, let alone China or Japan) reaped a lion's share of the gains from international trade and commerce over that period.<sup>34</sup>

Some part of the growth in commerce that generated feedbacks and spin-offs for the transition to an industrial economy occurred because the world economy as a whole was led forward at a faster rate by the continued expansion of the Atlantic economy coupled with the forging of closer commercial connexions between Europe and the Americas across the Indian and Pacific oceans with India, South East Asia, Japan and China. Indeed the British economy did exceptionally well during a long upswing in global trade that succeeded the consolidation of the Manchu dynasty (1644-83) and which coincided with the break-up of the Mughal Empire in India (1761-1818).<sup>35</sup>

Was that (as new and old Whigish historians maintain) because the country's institutions (particularly its Parliamentary system, framework of law and embedded cultures of enterprise) had evolved to become clearly more hospitable to private investment and innovation than institutions conditioning the development of rival economies on the mainland, as well as the maritime provinces in China and Tokugawa Japan?<sup>36</sup> Research into histories of continental economies and contemporary European perceptions has left historians more agnostic about the superiorities of the Hanoverian realm's institutions.<sup>37</sup> While recently rediscovered economic

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<sup>34</sup> J. Cuenca-Esterban, "Comparative Patterns of Colonial Trade: Britain and its Rivals," in L. Prados De La Escosura, ed., *Exceptionalism and Industrialization. Britain and its European Rivals 1688-1815* (Cambridge: Cambridge University Press, 2004), 35-69.

<sup>35</sup> A. Gunder Frank, *ReOrient. Global Economy in the Asian Age* (Berkeley: University of California Press, 1998), 63-171.

<sup>36</sup> C.P. Kindleberger, *World Economic Primacy 1500-1990* (Oxford, Oxford University Press, 1996).

<sup>37</sup> R. Sylla and G. Toniolo, *Patterns of European Industrialization* (London: Routledge, 1991); and G. Riello and P. O'Brien "Reconstructing the Industrial Revolution" 1-41.

worlds of “surprising resemblances” across a range of advanced regions of Eurasia, also undergoing Smithian growth for centuries before the First Industrial Revolution, has effectively degraded both Neo-Marxian and vulgar Weberian perceptions that only certain countries and regions of North Western Europe, (particularly England but also Holland) had proceeded along Smithian trajectories or Schumpeterian patterns of development leading stage by stage to modern economic growth.<sup>38</sup> Although most historians might agree that both societies appropriated increasing shares of the gains to be reaped from mercantilistic engagements in global trade and commerce.

Yet one potentially significant contrast between Britain and all other pre-modern rivals (including Holland) for a First Industrial Revolution has become clearer - namely the nations geographically conditioned but politically sustained fiscal commitment to a naval strategy for the defence of the realm - which carried unintended but benign consequences for the development of a maritime public-cum-private sector of the British economy which led the economy forward into a first Industrial Revolution.<sup>39</sup>

Not long after the Hundred Years War (1337-1453) when England's feudal armies had ignominiously retreated from centuries of dynastic warfare on the mainland, the Island's kings, aristocrats and merchants began to conceive of naval power, funded and managed by the Crown, as the first line of defence against external threats to the security of their stake in the wealth of the realm and as the force required to back conquest and commerce with continents outside Europe.<sup>40</sup>

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<sup>38</sup> K. Pomeranz, *The Great Divergence. China, Europe and the Making of the Modern World Economy* (Princeton, Princeton University Press, 2000).

<sup>39</sup> P. O'Brien, "Mercantilism and Imperialism in the Rise and Decline of the Dutch and British Economies," *The Economist* 148 (2000), 469-501.

<sup>40</sup> N. Rodger, *The Safeguard of the Sea. A Naval History of Britain, Vol.1 600-1649* (London: Allen Lane, 1997).

For reasons that cannot be expanded in a short essay, that conception took a long time to evolve into a constitutional consensus. Maturity came after nearly two centuries of fiscal stasis, economically malign disputes over religion, persistent acrimony between Parliament and the Crown's over rights to levy taxes and above all, from a reordering of political culture during an interregnum of destructive civil war and republican rule. Following on from the Restoration of monarchy and aristocracy, Britain's elite sustained the political consensus required to form a highly effective fiscal naval state.<sup>41</sup> With vicissitudes (including regime change, following from the Dutch coup d'état of 1688, and the loss of sovereignty over 13 American colonies in 1783) the restored British state became outstandingly successful in raising the funds (taxes and loans) required for external security, for the stability of an essentially *ancien regime*, for the maintenance and protection of an established and inequalitarian system of property rights.<sup>42</sup> The rights to own and use: natural resources and capital located within a unifying kingdom; merchant shipping and merchandize on the high seas; and bases, plantations, mines and slaves in colonies of an expanding empire became better protected for Britons than for any other propertied elite in Western Europe, the Americas, Africa and Asia.

This quite exceptional level of protection, stability and good order supplied by the State for its wealthier citizens rested upon an expanding fiscal and financial base.<sup>43</sup> Between 1670 and 1815 total revenues from taxes rose by a factor of around 17, while national income increased by a multiplier of 3. Most of these appropriations were allocated by central government to service a national debt incurred to fund no less than eleven wars against other European powers and economic rivals – mainly

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<sup>41</sup> H. Roseveare, *Financial Revolution* (London: Longman, 1991).

<sup>42</sup> J. Brewer, *The Sinews of Power: War, Money and the English State 1688-1783* (London: Unwin-Hyman, 1991).

<sup>43</sup> L. Prados De La Escosura, *Exceptionalism and Industrialization*.

conflicts with France and Spain, but including four naval wars against the Netherlands.

From a nominal capital of less than £2 million in the reign of James II Britain's national debt grew to reach to the astronomical sum of £854 million or 2.7 times the national income for 1819 and the shares of taxes devoted to servicing what appeared to taxpayers as an incubus of public debt jumped from modal ratios of 2-3% before the Glorious Revolution to 60% after the Napoleonic War.<sup>44</sup>

When Castlereagh signed the Treaty of Vienna all Europeans were acutely aware of the costs of geopolitical strife. Yet the, by then, United Kingdom of England, Wales, Scotland and Ireland enjoyed virtually complete security from external aggression, possessed the largest occidental empire since Rome, and had acquired in the course of centuries of prolonged mercantilist warfare, extraordinary shares of world trade and income from servicing global commerce. In 1815 its domestic economy stood half way through the First Industrial Revolution.<sup>45</sup>

To thrive in a mercantilist economic order riven with dynastic, imperial and economic rivalries, the Island state needed to allocate considerable resources to preclude invasion, preserve internal stability and retain advantages over its equally violent European competitors in armed struggles for gains from global commerce and colonization. Geopolitical conditions formed inescapable parameters within which state formation institution building and macro-economic growth occurred.<sup>46</sup> For the age of mercantilism post hoc analyses by historians based upon counterfactual scenarios concerned with distortions from competitive

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<sup>44</sup> P. O'Brien, "The Political Economy of British Taxation 1660-1815," *Ec.Hist.Rev.* 41 (1988), 1-32.

<sup>45</sup> P. O'Brien, "Fiscal Exceptionalism: Great Britain and its European Rivals from Civil War to Triumph at Trafalgar and Waterloo," in D. Winch and P. O'Brien, eds., *The Political Enemy of British Historical Experience 1688-1914* (Oxford: Oxford University Press, 2002), 246-65.

<sup>46</sup> K. Morgan, "Mercantilism and the British Empire 1688-1815," in Winch and O'Brien, eds., *The Political Economy of British Historical Experience 1688-1914*.

equilibria wrought by taxation, or unmeasured crowding out effects that flowed from high levels of government borrowing look like interesting, but anachronistic exercises in applied economies.<sup>47</sup> They are surely irrelevant to questions of whether the state had raised and allocated the resources that carried the kingdom and its economy to a plateau of safety, political stability and potential for future development attained and envied by the rest of Europe, at the Congress of Vienna. Since nobody then (or historians later) elaborated alternative strategies which combined security for the realm and internal order with growth for the economy, the comparison of an entirely explicable maritime strategy for security and development pursued by the British state with strategies pursued by other European and Asian powers could only lead to a Panglossian conclusion that *virtually everything that was done looks unavoidable, was undertaken for the best in the worst of all possible worlds and paid off.*<sup>48</sup>

Inaugurated under the republic, the essence of Britain's strategy for geopolitical security with economic power can be read from tabulations of its state's relative and persistently high levels of expenditure on the Royal Navy.<sup>49</sup> That sustained commitment provided the kingdom with the world's largest fleet of battleships, cruisers and frigates, manned by a largely coerced workforce of able seamen, under the command of a highly motivated and well rewarded corps of professional officers.<sup>50</sup> The fleet was constructed and maintained in readiness for multiple missions at sea by an onshore workforce of skilled shipwrights, carpenters and other artisans and sustained by an infra-structure of ports, harbours, dockyards,

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<sup>47</sup> J. Glete, *War and the State in Early Modern Europe* (2002 (London: Routledge, 2002), and A. Digby et al (eds.) *New Directions in Economic and Social History* (Basingstoke: Macmillan, 1992) 37-48.

<sup>48</sup> L. Gomes, *Foreign Trade and the National Economy* (Basingstoke, Macmillan, 1987).

<sup>49</sup> *Parliamentary Paper 1869-69* (XXXV), C. Chandaman, *English Public Revenue 1660-88* (Oxford: Oxford University Press, 1975). F. Dietz, *English Government Finance 1458-1641* (New York: Frank Cass, 1964).

<sup>50</sup> N. Rodger, *The Command of the Ocean. A Naval History of Britain, vol. 2 1649-1815* (London: Allen-Lane, 2004).

stores for victuals and spare parts, ordnance depots and other facilities under collaborative and coordinated public and private ownership and control.<sup>51</sup>

Once the Island's huge fleet and massive onshore infra-structure of human and physical capital were operating primarily to keep ships of line strategically placed at sea as the first bastion of defence for the realm; then at falling average cost the state could deploy cruisers, frigates and other well armed ships on mercantilist missions for the protection of British trade and its colonies; for predation on hostile and potentially hostile merchant marines; for the bombardment (actual or threatened) of enemy coastal cities and colonies.<sup>52</sup> Furthermore, Britain's evolving maritime strategy that logically combined defence with trade and growth turned out to include all kinds of attendant and unintended spin-offs for internal order, for the protection of property rights and for the extension of domestic as well as colonial and foreign markets.

For example, the nation's fleet of durable, strategically placed and proficient ships of the line (floating fortresses) provided external security at a relatively high level of efficiency compared to the logistical costs per joule of force delivered by larger European armies, recruited, mobilized, equipped, supplied with food and forage, and moved overland to battlegrounds, places of siege and vulnerable borders to repel enemy attacks.<sup>53</sup>

Its economically efficient offshore strategy for defence also allowed the British state to allocate greater proportions of revenues provided by an elastic fiscal and financial system not only to complementary

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<sup>51</sup> R. Morris, *Naval Power and British culture. Public Trust and Government Ideology* (Aldershot: Ashgate, 2004).

<sup>52</sup> D. Baugh, "The Eighteenth Century Navy as a National Institution," in J.R. Hill, ed., *The Oxford Illustrated History of the Royal Navy* (Oxford: Oxford University Press, 1995), 120-60.

<sup>53</sup> R. Harding, *The Evolution of the Sailing Navy 1509-1815* (Basingstoke: Macmillan, 1995) and J. Landers, *The Field and the Forge. Population, Production and Power in the Pre-Industrial West* (Oxford: Oxford University Press, 2003).

mercantilist and imperial missions pursued at sea, but to sustain surprisingly high levels of military expenditure.<sup>54</sup> Paradoxically and throughout the period 1688-1815, expenditures on armies by the Eurasian state most committed to naval power amounted to a modal 60% of the total allocated to the realm's armed forces.<sup>55</sup>

Part of that allocation included the costs of hiring mercenary regiments of Hanoverian, Hessian and other soldiers for combat outside the kingdom; part consisted of subsidies and subventions to European allies willing to field troops to contain and thwart the designs of France and its allies on the mainland, in India and the Americas; and finally a contentious, part consisted of the commitment of British troops to theatres of war on the continent, notably in 1702-12 and 1808-15. Strategic expenditures on the military forces of Britain's clients and allies prevented Bourbon states (France and Spain) and other antagonists from allocating funds to construct fleets of a capability required to mount serious challenges to the Royal Navy's defence of the realm and its increasingly effective protection of the nation's interests overseas.<sup>56</sup>

But a considerable proportion of revenues, surplus to requirements for the navy was allocated to British regiments, militias, volunteers and yeomanry on stations in the realm. They served as a less than credible second line of defence against foreign invasions, but were utilized consistently, over a period of population growth, industrialization and urbanization, to preserve the stability of the regime against subversion on

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<sup>54</sup> P. O'Brien and P. Hunt, "England 1485-1815," in R. Bonney, ed., *The Rise of the Fiscal State in Europe, c.1200-1815* (Oxford: Oxford University Press, 1999), 53-100.

<sup>55</sup> *Parliamentary Paper 1868-69* (XXXV).

<sup>56</sup> D. Baugh, "Great Britain's Blue Water Policy 1689-1815," *Int.Hist.Rev.* X (1988), 33-58.

its Celtic fringes and to protect hierarchy and property rights against challenges to law and order.<sup>57</sup>

From time to time prospects for internal trade within a less than United Kingdom came under threat from within the potentially seditious provinces of Scotland and Ireland; particularly the latter where a colonized Catholic population resented “English” property rights and the metropole’s discriminatory regulation of Irish commerce and industry.<sup>58</sup> With external security taken for granted, other public goods such as stability, good order, the maintenance of property rights and support for hierarchy and authority over potentially unruly employees became the key political-cum-economic interest for landowners, merchants, farmers, industrialists and other businessmen of Hanoverian Britain. On the whole, a monarchical and aristocratic state met their concerns and when lobbied redefined legal rights for new forms of wealth by promulgating statutes for the realm which superseded custom and common laws that could counterfactually have been used to provide protection for the welfare of the majority of the nation’s workforce without assets, status and power, but threatened by market forces associated with industrialization.<sup>59</sup>

For example, the institutions of the Elizabethan poor law for dealing with poverty, unemployment, vagrancy and labour migration maintained a repressive system of control over the labour of juveniles, females and unskilled men. For less vulnerable artisans and industrial workers and especially for courageous groups who formed “combinations” to challenge what they perceived to be adverse changes to a traditional and more moral economy, the punishments prescribed by Parliament for: the formation of unions; for riots against high prices of basic necessities; for

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<sup>57</sup> P. O’Brien, “The State and the Economy 1688-1815”, in R. Floud and D. McCloskey, eds., *The Economic History of Britain since 1700, vol. 1* (Cambridge: Cambridge University Press, 1994), 205-41.

<sup>58</sup> L. Cullen, *An Economic History of Ireland since 1660* (London: Batsford, 1987).

<sup>59</sup> J. Rule, *Albion’s People. English Society 1714-1815* (London: New York: Longman, 1992)



resistance to enclosures and turnpikes; to attacks upon mills, barns, factories and labour saving machinery; for insubordinate and disorderly conduct as well as every kind of theft became discernibly harsher and, under an ever extending bloody code of law, increasingly subject to capital punishment.<sup>60</sup>

Parliament's antipathies to large standing armies in times of peace looks like Whig rhetoric because the actual numbers of troops, embodied militiamen and patriotic volunteers on station in Britain and Ireland year after year (and particularly in wartime) were more than adequate to repress disturbances to the peace. For purposes of political stability, maintaining internal order, the protection of property and upholding hierarchies of all kinds, it is not at all obvious that on a per capita basis, the political and legal authorities of constitutional Britain commanded a smaller or less coercive force of troops than so called "despotisms" on the mainland of Europe, who deployed armies (not capital intensive navies) to defend their more vulnerable frontiers. Indeed in 1808 the numbers of soldiers mobilized to combat Luddites in the Midlands and North of England exceeded troops under Wellington's command in the Peninsular.<sup>61</sup> With virtually no police at their command, the Navy allowed the political authorities (central, county and local) of Hanoverian Britain to allocate less of their revenues to external security and to provide an effective military presence and exemplarily displays of the armed and flexible force required to maintain good order, protect property and preserve authority among a potentially ungovernable society becoming more urban and "dangerous" by the year but which was eventually subjugated and cajoled into a culture of deference that characterized Victorian society.

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<sup>60</sup> J. Brewer and J. Styles, eds., *An Ungovernable People: the English and their Law in the Seventeenth and Eighteenth Centuries* (London: Hutchinson, 1980)

<sup>61</sup> C. Emsley, *Crime and Society in England 1750-1900* (London: Longman, 1987)

#### 4. The Discovery, Take up and Diffusion of “English” Technology

For several reasons, the invention and diffusion of a familiar list of machines, energy converters and industrial processes, long represented as “English” and regarded as prime movers behind the national economy’s precocious transition, seems to have been relegated from a traditionally clear position of prominence into contexts where their importance has been historicized. That has occurred not only by way of significance testing by cliometricians but because the Industrial Revolution is no longer Anglocentrically or Eurocentrically conceived as a short sharp discontinuity based upon fundamental breakthroughs in industrial technologies emanating from and developing within a singularly progressive set of Anglo-Saxon institutions and cultures.<sup>62</sup>

Several inventions certainly emerged and matured in Britain after the Seven Years War, but their effects were probably confined to particular sectors of industry (cotton textiles, metallurgy, shipbuilding, transportation and the generation of energy from steam).<sup>63</sup> Furthermore, technologies that became first the wonders and eventually the marks of a modern economy (machines, steam power, processes for making and shaping metals, chemicals, factories, etc.) appeared early but matured rather slowly over that century of “revolutionary transition” after 1756. Tabulations purporting to account in quantitative terms for the sources of British economic growth (derived from exercises that “fit” production functions to extant but imperfect data for national output and inputs of land, labour and capital) expose the persistence of an entirely traditional and extensive form of aggregated economic growth, emanating mainly

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<sup>62</sup> A. Pacey, *The Maze of Ingenuity. Ideas and Idealism in the Development of Technology* (Cambridge, Mass: MIT Press, 1994).

<sup>63</sup> For this debate see M. Berg and P. Hudson, “Rehabilitating the Industrial Revolution,” *Econ.Hist.Rev.* 45 (1992), 269-35; P. Temin, “Two Views of the British Industrial Revolution,” *Jnl.Econ.Hist.* 57 (1997), 63-82; N. Crafts and K. Harley, “Output Growth and the British Industrial Revolution: a Restatement of the Crafts-Harley View,” *Econ.Hist.Rev.* 45 (1992), 703-30 and N. Crafts and K. Harley, “Simulating the Two Views of the Industrial Revolution,” *Jnl.Econ.Hist.* 60 (2000), 819-41.

from somewhat higher rates of capital accumulation and upswings in the size and hours worked by the workforce rather than innovations or even new sources of energy *per se*.<sup>64</sup>

These essentially taxonomic exercises have provided some kind of nationwide perspective derivable from cliometric models designed to measure *proximate* sources behind the growth of British national output (gdp). Nevertheless the contribution of technological change and organisational complexity (which had proceeded slowly over the centuries in many regions of a connected but not integrated Afro-Asian Oikumene) is more heuristically measured and defined by two widely recognized hallmarks of modern economic growth, namely accelerated and sustained rates of growth in output per worker and incomes per capita.<sup>65</sup> For the British case and after protracted debate over the models and the statistics, cliometricians now take into account the tentative quality of the data at their disposal and reciprocal interactions between profitable opportunities provided by the appearance of new process and product innovations on the one hand and higher rates of investment on the other. In terms of the parameters and taxonomies specified by growth models, technological progress turns out to have evolved over time to reach a vantage point around the mid-nineteenth century when its outcome can be retrospectively perceived and heuristically represented as highly significant – if not overwhelming. For changes in labour productivity and standards of living in this macro-economic context, without the discovery, development and diffusion of technologies and improved modes of organization that augmented the average productivity of its workforce, the

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<sup>64</sup> N. Crafts, "Productivity Growth in the Industrial Revolution: a New Growth Accounting Perspective," *Jnl.Econ.Hist.* 64 (2004), 521-35.

<sup>65</sup> J. Mokyr, "Accounting for the Industrial Revolution," in Floud and Johnson, eds., *Cambridge Economic History of Modern Britain*, 1-27.

British economy would never have been designated as the locus of The First Industrial Revolution.<sup>66</sup>

Nevertheless, the role for new technology coming on stream in Britain at that time can be relegated to a chapter of a longer and more complex historical narrative, which recognizes its confined scale, scope for transformation and potential across all sectors, not only of the national economy, but of manufacturing itself. Economic histories of a range of industries (other than that paradigm case of revolutionary change), cotton textiles, have made us aware of the decades taken and costs incurred to move from a blueprint, through several stages of development and protracted periods of learning by using until original and promising designs became marketable prototype machines, processes or artefacts.<sup>67</sup> We now realize that the forward planning and investment are required to embody a backlog of known product and process innovations in firms that were connected to markets for commodities, labour and capital also took decades to mature. Furthermore such firms had to be networked to suppliers of raw materials and to transportation and distribution services so that entrepreneurs exploiting new knowledge could realize external economies of scale and agglomeration by locating in industrial towns and maritime cities. The costs of system-wide investments to develop, embody and relocate production in factories and towns turned out to be large multipliers of the original outlays borne by private individuals and their networks for the research and development required to come up with the potentially useful and commercially viable knowledge in the first place.<sup>68</sup>

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<sup>66</sup> N. Crafts, "The First Industrial Revolution: Resolving the Slow Growth/Rapid Industrialization Paradox?" *Jnl. of European Ec.Assocn.* 3 (2005), 525-34.

<sup>67</sup> R. Church and A. Wrigley, eds., *The Industrial Revolutions*, 11 volumes (Oxford: Blackwells, 1994), vols. 8-10.

<sup>68</sup> V. Ruttan, *Technology, Growth and Development: An Induced Innovation Perspective* (Oxford,: Oxford University Press, 2001), part 2.

As pioneer movers into unexplored realms and spaces for the exploitation of novel industrial products and technologies, British investors and entrepreneurs lacked examples of anything like the required range of prior experiments and experience from elsewhere as well as access to an extensive and reliable base of systemic scientific theories of how, where and why things work that later in the nineteenth century could be utilized to expose the problems, ramifications and potential of untried knowledge more rapidly and at lower cost.<sup>69</sup> In short latecomers and subsequent industrializers entered into their transitions with advantages unavailable to Britain.<sup>70</sup>

Nevertheless and although British investors lacked references to practice elsewhere and to science to inspire confidence to undertake risky investments in new technologies, their direct support for research and development and for a more rapid and extensive diffusion of the potentially useful knowledge already available early in the eighteenth century does not appear, with hindsight, to have been particularly “entrepreneurial”. Considered as a national group, British businessmen promoted and managed one of the slowest, and for the working classes, more miserable transitions to an industrial economy in world history.<sup>71</sup>

Subsequent faster and often more socially benign industrial revolutions are marked by higher rates of saving and investment and a more rapid take up of advanced technology than British investors and businessmen seem to have been willing to contemplate and undertake for a First Industrial Revolution.<sup>72</sup> For example, in the British case the ratio of gross investment to national income took more than a century to

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<sup>69</sup> J. Mokyr, *Gifts of Athena: Historical Origins of the Knowledge Economy* (Princeton: Princeton University Press, 2002).

<sup>70</sup> A. Amsden, *The Rise of the Rest. Challenges to the West from Late Industrializing Economies* (Oxford: Oxford University Press, 2001).

<sup>71</sup> Riello and O’Brien, “Reconstructing the Industrial Revolution.

<sup>72</sup> A. Maddison, *The World Economy, a Millennium Perspective* (Paris: OECD, 2001).

double from a rather low base point of around 6% in 1760.<sup>73</sup> In relation to countries that followed Britain into industrial revolutions this looks, again in retrospect, like unimpressive average and marginal propensities to save and invest in the social overhead and industrial capital required to promote faster urbanization.<sup>74</sup>

The slow rise in domestic capital accumulation required to exploit new technology cannot moreover be attributed to the massive sums of otherwise surplus investible funds borrowed by the State to fund three wars (1756-63, 1776-83, and 1789-1815) against France and other European rivals and the United States.<sup>75</sup> Counterfactually Government borrowing for purposes of waging war (in all eleven conflicts from 1652-1802) might in theory have “crowded out” some potential for higher rates of private capital formation, but the overall effect could well have been trivial. Firstly, the observed variations between years of war and interludes of peace in real rates of interest received by investors on low risk government securities floated and sold on the London capital market, does not suggest that Britain was an economy constrained by capacities to save. On the contrary, the overall supply of investible funds that appeared during all three major wars, 1756-1793, appears rather elastic with respect to additional demands from a state that offered both domestic and international capital markets attractive and secure paper assets. At the time government borrowing also promoted the development of financial intermediation in London and the integration of a national capital market across the kingdom (linked to European capital

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<sup>73</sup> C. Feinstein and S. Pollard, eds., *Studies in Capital Formation in the United Kingdom 1750-1820* (Oxford: Oxford University Press, 1988).

<sup>74</sup> P. Mathias and M. Postan, eds., *The Cambridge Economic History of Europe*, Vols. 7 parts 1 and 2, Capital, Labour and Enterprise (Cambridge: Cambridge University Press, 1978).

<sup>75</sup> Digby, *New Directions in Economic and Social History* 37-48.

markets) which raised both the elasticity of supply and improved the allocation of investible funds.<sup>76</sup>

Furthermore, and to return to the analysis of strategic expenditures outlined above, models of crowding out that neglect the benefits (and incentives for investment) provided by high rates of expenditure by the state upon external security, the protection of commerce and colonization overseas and a repressive, but relatively effective system of internal order, are seriously under-specified. Balance sheets (costs and benefits) flowing from expenditures upon these indispensable public goods would be difficult to model and impossible to add up. Given that rather high levels of expenditure on the army and navy were necessary for state formation and the preservation of British institutions (particularly when periodic threats of invasion by sea appeared in wartime) the crowding out hypothesis needs to be reformulated as an historical problem of estimating the proportions of taxes and loans devoted to security and stability that might conceivably be defined as “unnecessary and wasteful” appropriations and allocations by the Hanoverian state. Few mercantilists of the period suggested that the depressing effects on private savings and investment flowing from the operations of the fiscal and financial system exceeded the benign effects of “crowding in” which they argued, depended upon the effective provision of external security, successful mercantilism, stability and internal order.<sup>77</sup> Adam Smith certainly appreciated that defence came before opulence and that unilateral withdrawal from the prevailing geopolitical order surrounding an Island state was never an option or historians, will add, a counterfactual worth pursuing.<sup>78</sup>

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<sup>76</sup> Prados De La Escosura, *Exceptionalism and Industrialization*, 35-69.

<sup>77</sup> T. Hutchison, *Before Adam Smith. The Emergence of Political Economy* (Oxford: Oxford University Press, 1988).

<sup>78</sup> K. Tribe, “Mercantilism and Economics of State Formation,” in L. Magnusson, ed., *Mercantilist Economics* (Boston: Kluwer, 1993).

Once expenditures by the state are reconfigured as positive (or at least unavoidable for macro-economic growth) then in retrospect rates of development and take up of advanced technologies and urban systems of production by businessmen and investors during an ostensibly revolutionary period in British economic history, cease to appear anything like as entrepreneurial and historically remarkable as Anglo-American historiography has, for too long, maintained. Indeed the way back into a properly conceptualised and contextualized historical analysis of The First Industrial revolution is already underway, by locating the conjuncture in long run global economic history and (as the new Cambridge School in the history of the political economy advises) by reconstructing its place in discourses of the day. After all, at the time classical economists recognized there was nothing particularly “progressive” about the country’s economic elite.<sup>79</sup> Majorities (among the owners and controllers of property rights to the nation’s cultivable land, sub-soil minerals urban sites and real estate, transportation systems, commercial and distribution networks, banks and other forms of financial intermediation, industrial buildings, plant and machinery, human and professional capital) reinvested rather low proportions of the rentier type gains accruing to them from industrialization.

Predictably generations of a national and patriotic history profession researching into the Island’s agriculture, commerce and industry and in touch with the records of firms and the biographies of exceptional men of wealth have published what now aggregates into a library of case studies that displays a clear and favourable impression of British landowners, farmers, merchants, industrialists, bankers, professional experts and others with surpluses to save and invest in the new technologies and urban systems of production that came on stream

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<sup>79</sup> G. Stedman-Jones, *An End to Poverty. A Historical Debate* (London: Profile Books, 2004).



after Britain's decisive victory for external security with imperial hegemony in the Seven Years War. But did British capitalists manifest a national geist or kopf for risk taking and improvement that was possibly very different from anything displayed by their cautious counterparts on the mainland.<sup>80</sup> Of course, numerous and well documented examples of commendable foresight, perseverance, risk taking, innovation and entrepreneurship, particularly for leading industries, can be drawn from the rich historiography of the First Industrial Revolution.<sup>81</sup> Nevertheless, a generation of research has constructed a statistical base in order to engage with potentialities for illumination derived from macro economic modelling. This programme in economic history (as Robert Allen's recent synthesis shows) has seriously qualified (if not degraded) the notion that an insular "culture" ordering economic behaviour on the British Isles could be represented as exceptionally enterprising.<sup>82</sup> Looking retrospectively at The Industrial Revolution configured as a macro economic event, connected to and increasingly embedded in a wider world economy, several statistically validated reasons suggest that (within an environment of incomparable security provided and sustained by the Hanoverian state for the nation's businessmen and wealthy elites), the take up of new technology, the construction of urban agglomerations and formation of social overhead capital required to realize the full potential of technologies that appeared after the Seven Years War seems anything but impressive.

Unimpressive is a post hoc but defensible representation because nothing in the macro economic data currently available suggests that: (a) rates of return accruing to owners of property declined during the

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<sup>80</sup> E. Rothschild, "The English Kopf," in Winch and O'Brien, eds., *The Political Economy of British Historical Experience*, 31-60.

<sup>81</sup> Dauntton, *Progress and Poverty*.

<sup>82</sup> Allen, "Capital Accumulation, Technological Change and the Distribution of Income during the British Industrial Revolution" (Oxford University, Department of Economics Discussion Paper 239, 2005)

Industrial Revolution, (b) that gains from investment in the capital formation required for faster and more extensive industrialization, combined with urbanization were being steadily eroded by rises in real product wages that exceeded or even converged upon the observed increase in labour productivity, or (c) that warfare was anything other than part (rather than a costly diversion) from the whole historical process. On the contrary, macro economic trends (as currently measured for this century of revolution) all look favourable and promotional for higher rates of saving investment and innovation. For example (and after falling below the 10% mark during the recession in economic activity that surrounded crisis and war with England's Thirteen colonies in North America) average rates of return on all forms of capital other than agricultural land fluctuated cyclically, but had doubled before the mid-nineteenth century. By then even real rents from farmed land (the sector in relative decline) had risen by nearly 50%. Over the century that succeeded the seven years war, average real wages passed through three cycles or phases: slow improvement (c.1761-1800), virtual stasis (1800-20) and upswing (1820-51) and reached a point around mid-century which stood some 45% above their initial level.<sup>83</sup>

Meanwhile labour productivity had followed a different trajectory and a faster rate of increase to arrive at a level 87% above its base line average. Classical features of all industrial revolutions, namely higher rates of growth in labour productivity, emanating from general purpose technologies, combined with increasing returns derived from the agglomeration of production in towns probably became more evident during The First Industrial Revolution than they had already been during the Italian Renaissance, Dutch Golden Age or earlier efflorescences.<sup>84</sup>

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<sup>83</sup> Feinstein, "Pessimism Perpetuated: Real Wages and the Standard of Living in Britain during and after the Industrial Revolution," *Jnl.Econ.Hist.* 38 (1998), 625-58.

<sup>84</sup> J. L. Van Zanden, "Wages and Standards of Living in Europe 1500-1800," *Eur.Rev. of Econ.Hist.* 3 (1999), 175-98.

Yet the British case was marked by a uniquely gradual rate of change, a slow take up of new technology and we might well say “deplorably” low rates of investment in the housing and infrastructures of towns required to support a more rapid and less immiserising transition to industrial society.<sup>85</sup>

This feature of the First Industrial Revolution rather than machinery and factories aroused condemnations from visitors from the mainland as well as generations of British reformers concerned with the health of town and the conditions of those whose labour made the transition both possible and necessary.<sup>86</sup> Amelioration and jack up in investment rates took a long time to achieve, partly because the fiscally emasculated state that emerged from the Napoleonic wars could not raise the taxes to do much to help other than continue to protect the realm’s commerce and expanding empire overseas; partly because average real wages (and aggregate demand) increased very slowly but partly because British economic elites, with enviable capacities to save, reinvested such small proportions of the rising share of the “rentier type” income that they obtained from their stakes in prior and often inherited ownership of property rights during a period of transition to an urban industrial economy.<sup>87</sup> Although the commendable examples of enterprise behind the riskier and innovatory investments in industry and commerce that appeared during the period testify to the entrepreneurship of some Britons, their laudable achievements need to be contextualized within macro economic frameworks, recently constructed by Allen, Clark, Crafts, Harley, Mokyr, Voth and other cliometricians in order to reconfigure the Industrial Revolution as a precocious but unremarkable and rather

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<sup>85</sup> N. Crafts, “British Industrialization in an International Context,” *Jnl. of Interdisciplinary Hist.* 19 (1989), 415-28.

<sup>86</sup> Riello and O’Brien, “Reconstructing the Industrial Revolution.

<sup>87</sup> O’Brien, “Aristocracies and Economic Progress under the Ancien Regime,” in P. Janssens and B. Yun-Casalilla, eds., *European Aristocracies and Colonial Elites* (Aldershot: Ashgate, 2005).

predicable transition in the long global history for the accumulation of useful and reliable knowledge.

Furthermore, very few economic historians now regard this famous conjuncture in British economic history as a paradigm for comparable changes that followed elsewhere, or believe that standards of living or labour productivities currently displayed by the world's industrial market economies would look very different, but for the transformation that occurred in Britain between 1750 and 1846.<sup>88</sup>

In so far as the discovery and development of new technologies for industry, transportation and agriculture that appeared during this period can be linked to an evolving base of systemic knowledge the scale, scope and utilitarian relevance of that kind of knowledge can moreover be realistically depicted as Eurasian rather than British in origin. Britain's advantages resided more in the development, improvement and diffusion of technology than in discovery itself.<sup>89</sup> Yet some historians (notably Margaret Jacobs and Ian Inkster) argue that in a European, but perhaps more plausibly in an Asian context, British "culture" became more receptive to an intermingling of science with business, with religion and with politics than was the case elsewhere across Eurasia.<sup>90</sup> Studies of several contexts for the advance and diffusion of useful and reliable knowledge in France, Italy and even Spain, has, however, made it more difficult to accept Anglocentric assertions that mainland European monarchs, aristocracies, ecclesiastical and political elites, and especially the military, were somehow less "rational" and open to the potentialities of

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<sup>88</sup> But see D. Landes, *The Wealth and Poverty of Nations* and D. Landes, *The Unbound Prometheus. Technological Change and Industrial Development in Western Europe from 1750 to the Present Day* (Cambridge: Cambridge University Press, Second Edition, 2004).

<sup>89</sup> J. Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (Oxford: Oxford University Press, 1990).

<sup>90</sup> M. Jacob, *Scientific Culture and the Making of the Industrial Revolution* (Oxford: Oxford University Press, 1997), and I. Inkster, *Potential Global. A Story of Useful and Reliable Knowledge and Material Progress in Europe 1474-1914* (unpublished paper, University of Nottingham Trent).

new knowledge than their counterparts off-shore.<sup>91</sup> That debate seems to be something of a hangover from religious controversies over the reformation, including memorable, but unproven, theories about the positive connexions between Protestantism and entrepreneurship, Protestantism and hard work as well as Protestantism and science, lifted uncritically from Max Weber's and Robert Merton's seminal hypotheses.<sup>92</sup> It is surely not the case that the urban and commercial cultures of Europe's (even Asia's) maritime cities could be represented as discernibly less rational, calculating and utilitarian than cultures operating in British towns, embodied in British educational institutions, or evident in British publishing and information flows.<sup>93</sup> Yet Roy Porter has made claims for the exceptionalism of a British enlightenment, in contrast to another controversial interpretation of the "long 18th century" in British history as a period marked by the persistence of an *ancien regime* presided over by an autocratic, aristocratic and confessional state. Cultural turns by nations, cities or elites towards progress are difficult to expose, let alone measure.<sup>94</sup>

Early in the eighteenth century, European visitors did, however, recognize, that British industry was moving ahead in certain spheres of industrial technology. Indeed, several governments engaged in espionage in order to repair gaps as they opened up, particularly for technologies with military potential.<sup>95</sup> The appearance of British machines on the mainland even in Catalonia occurred rather rapidly before the outbreak of

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<sup>91</sup> W. Clark, et al, eds., *The Sciences in Enlightened Europe* (Chicago: Chicago University Press, 1999).

<sup>92</sup> J. Brooke, *Science and Religion. Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991).

<sup>93</sup> P.O'Brien et al, eds., *Urban Achievements in Early Modern Europe. Golden Ages in Antwerp, Amsterdam and London* (Cambridge: Cambridge University Press, 2001).

<sup>94</sup> R. Porter, *Enlightenment Britain and the Creation of the Modern World* (London: Allen Lane, 2001); and J. Clark, *English Society 1688-1832* (Cambridge, Cambridge University Press, 2002).

<sup>95</sup> J. Harris, *Industrial Espionage and Technology Transfer. Britain and France in the Eighteenth Century* (Aldershot: Ashgate, 1997).

the French Revolution and the long interlude of destructive warfare that arrested diffusion to the mainland, 1791-1815. Across Europe technological advances tended to appear, moreover, in branches of industrial production which had reached a certain scale and diversity in production. In some well known British cases (cotton and bar iron are examples) that occurred after processes of import substitution. Foreign products obtained and pioneered access to their home market and that tempted British businessmen to press for protection and to engage in a search for indigenous ways of satisfying first domestic, then imperial, and eventually, foreign demand. The process involved the creation, by a sympathetic mercantilist state, of helpful matrices of legislation and fiscal incentives surrounding commodity and labour markets for Britain and its imperial possessions.<sup>96</sup>

Technological progress depended, above all, on the prior accumulation of a skilled and mobile industrial workforce of artisans and craftsmen. To explain how, when and why the British economy managed to build up the range of skills required to carry breakthroughs and improvements in technological knowledge through a necessary stage of development to the point of commercial viability has not been easy.<sup>97</sup> Economic theory is not particularly helpful in explaining the formation of human capital, but economic history is generating promising findings from the records of Europe's urban guilds, and their connexions to the rise, embodiment and maintenance of skills among European workforces. Alas that programme is not yet at a stage where valid contrasts across

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<sup>96</sup> J. Inikori, *Africans and the Industrial Revolution in England* (Cambridge: Cambridge University Press, 2002).

<sup>97</sup> L. Hilaire-Perez, *L'invention technique au siècle des lumières* (Paris: Albin-Michel, 2000).

continents, countries, regions and towns can be discerned and explained.<sup>98</sup>

For Eurasia the relevant contexts for human capital formation were invariably urban. On the Isles, London, Bristol, Nottingham, Birmingham, Glasgow and even Dublin all became important locations for the development of skilled workforces. Immigrant German, Flemish, Dutch and Huguenot craftsmen, merchants and financiers, clearly played an important role in starting and sustaining the process in Britain. Skilled men could be attracted from the mainland to a kingdom that promised security from external aggression, religious toleration and which, from time to time, offered them royal protection and subsidies. When they developed interests in trade with the Americas, Africa and Asia they could be assured of protection from the Royal Navy. Europeans settled and, as part of extended families and diasporas, maintained links with kin and communities embodying useful knowledge on the mainland. In an age in which the diffusion and adaptation of technology occurred basically through the migration of skilled and professional manpower, the obvious attractions of a shorter or longer domicile in English towns was reinforced by warfare and religious persecution on the mainland.<sup>99</sup>

## **5. Conclusions: Deconstructing and Reconstructing the First Industrial Revolution**

After the Seven Years War the British economy passed through a century of accelerated growth with structural change that merits the appellation of The First Industrial Revolution. This long cycle, together

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<sup>98</sup> S. Epstein, "Transferring Technical Knowledge and Innovating in Europe" Department of Economic History Working Paper 01-05 (2005) 1-39 and M. Prak and S. Epstein, *Guilds, Innovation and Economy in Europe* (London: Routledge, forthcoming 2006).

<sup>99</sup> D. Keene and S.R. Epstein, eds., *The Rise of a Skilled Workforce in London 1500-1800* (Cambridge, Mass: MIT Press, forthcoming 2007)

with the wars against Revolutionary and Napoleonic France, carried the Island to the clear position of competitive advantage it enjoyed over the economies of Continental Europe and the rest of the world between 1846 and 1873.

That “moment” of economic dominance took centuries to mature, looks brief and was based to a significant degree upon natural advantages and naval power. Britain’s technological hegemony was, it seems, proximately European and historically Eurasian in origin confined to textiles, metallurgy and engineering, and destined to pass away through the traditional and familiar workings of diffusion, adaptation and convergence processes.<sup>100</sup>

In order to help scholars, publics, politicians and the mass media to comprehend The First Industrial Revolution and the rather rapid convergence of Western Europe into an inter-related and ultimately integrated set of highly successful industrial market economies, it is now necessary to place the British transition within much longer time spans and wider geographical frames that include Africa, the Americas and East Asia, as well as the mainland.<sup>101</sup> In Hodgson’s long stream of time and a recently revealed pre-modern “world of surprising resemblances”, the Industrial Revolution can be re-contextualized as a precocious but not that remarkable conjuncture in mankind’s escape from diminishing returns endemic to organic economies. Real growth (florescence’s) in labour productivity and incomes per capita had occurred in other places and other times for centuries prior to the Seven Years War but before long natural disasters, geopolitical shocks and Malthusian checks returned complex but organically based urban economies to stasis or very slow

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<sup>100</sup> K. Bruland, ed., *Technology Transfer and Scandinavian Industrialization* (Oxford: Berg, 1991) and M. Teich and R. Porter, eds., *The Industrial Revolution in National Context* (Cambridge: Cambridge University Press, 1996).

<sup>101</sup> For an eloquent, but highly polemicized elaboration of Hodgson’s argument see J. Hobson *The Eastern Origins of Western Civilization* (Cambridge: Cambridge University Press, 2004)



growth. Geography ensured that the Isles were predestined to avoid the first. In the wake of an interregnum of civil war and republican rule, a properly funded Royal Navy emerged to protect the economy from the second. Then a less than astonishing and gradual diffusion of new technologies and inorganic sources of energy turned out to be sufficient to confound Malthus and produced a First Industrial Revolution. Britain escaped first. Western Europe and its European offshoots overseas soon followed. High and rising standards of living can now be observed in many regions of an integrating world economy. In this frame of historical reference, being first matters a lot less than the North-South divide and the persistence of mass poverty. For solutions to that problem there is no British model, no distinctively British enlightenment and no need for patriotic histories of a First Industrial Revolution, proclaiming Britain, Holland or any other nationally constructed location or culture as the locus or origin, and certainly not as the paradigm for modern economic growth after all, our colleagues in art history tell us that the Florentines are no longer the proud possessors of the Renaissance, while modern Chinese and Japanese scholars now correctly observe neither English (nor European) history can be represented global destiny.<sup>102</sup> And, to repeat, Marshal Hodgson told us four decades ago that “without the cumulative history of the whole Afro-Eurasian Oikoumene of which the occident has been an integral part, the Western transmutation would be almost unthinkable.”<sup>103</sup> The British Industrial Revolution is not separable from global history.

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<sup>102</sup> R. Bin Wong, “The Political Economy of Agrarian Empire and its Modern Legacy,” in T. Brook and G. Blue, eds., *China and Historical Capitalism* (Cambridge, Cambridge University Press, 1999) 210-45, and K. Sugihara, “The East Asian Path of Economic Development: a Long Term Perspective” in G. Arrighi (ed) *The Resurgence of East Asia* (London: Routledge, 2003).

<sup>103</sup> M. Hodgson, *Rethinking World History* (Cambridge: Cambridge University Press, 1993) 68.

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