

THE DIVERGENCE OF ENGLAND: THE GROWTH  
OF THE ENGLISH ECONOMY IN THE  
SEVENTEENTH AND EIGHTEENTH CENTURIES

*The Prothero Lecture*

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THAT something remarkable was happening in England in the quarter millennium separating the late sixteenth century from the early nineteenth is plain. In Elizabeth I's reign the Spanish Armada was perceived as a grave threat: the English ships were scarcely a match for the Spanish, and the weather played a major part in the deliverance of the nation. By the later eighteenth century the Royal Navy was unchallenged by the naval forces of any other single country, and during the generation of war which followed the French revolution, it proved capable of controlling the seas in the face of the combined naval forces mustered by Napoleon in an attempt to break the British oceanic stranglehold.<sup>1</sup> Growing naval dominance was a symbol of a far more pervasive phenomenon. In the later sixteenth century England was not a leading European power and could exercise little influence over events at a distance from its shores. The Napoleonic wars showed that, even when faced by a coalition of countries occupying the bulk of Europe west of Russia and led by one of the greatest of military commanders, Britain possessed the depth of resources to weather a very long war, enabling her to outlast her challenger and secure a victory.<sup>2</sup> The combination of a large and assertive Navy and dominant financial and commercial strength meant that, in the early decades of

<sup>1</sup>Or, as J. Brewer put it, 'From its modest beginnings as a peripheral power – a minor, infrequent almost inconsequential participant in the great wars that ravaged sixteenth and seventeenth-century Europe – Britain emerged in the late seventeenth and early eighteenth centuries as the military *Wunderkind* of the age.' J. Brewer, *The Sinews of Power: War, Money and the English State 1688–1783* (1989), xiii. What was true in the early eighteenth century was true *a fortiori* by its end.

<sup>2</sup>The fact that it is accurate to refer to England when describing events in the sixteenth century, but to Britain when attention is transferred to the eighteenth and nineteenth centuries is, of course, itself highly significant. I shall be less than punctilious in this regard in this essay, normally referring to England when it might be more accurate to refer to Britain or even to the British Isles, but since much of my discussion is concerned with long periods of time, I hope it is an acceptable simplification to write of England rather than to attempt greater precision.

the nineteenth century, Britain was able to impose her will over large tracts of every continent. But her dominance did not grow out of the barrel of a gun. It derived chiefly from exceptional economic success: it grew out of the corn sack, the cotton mill, and the coal mine.

In a long-settled area which largely shares a common culture and technology it is unusual for one political entity substantially to increase its relative 'weight' compared with other political units unless it expands territorially in the manner of the Chinese or the Roman empires. This is likely to be especially true of pre-industrial political entities because every such economy had an 'organic' base.<sup>3</sup> The land provided almost all material products of value to man. Density of settlement and ability to produce material goods were closely linked to the productivity of the soil. Hence the tendency on the part of a rising power to seek territorial expansion both to symbolise and to consolidate a temporary advantage: Prussia in the late seventeenth and eighteenth centuries is an example of this mode of expansion. There will be exceptions to any generalisation of this kind but few more striking than the experience of England in the early modern period. The remarkable relative increase in English power sprang principally from what might be described as an intensification rather than an extensification of her territory.<sup>4</sup>

My intention in this essay is draw attention to some features of English history between the later sixteenth and the early nineteenth centuries which exemplify the exceptional character of English development relative to that of most neighbouring continental countries. Economic success was at the heart of the differential success of England and it is with this aspect of the period that I shall be chiefly concerned, though I shall also touch on wider questions about capitalism and modern economic growth.

To provide a perspective for subsequent discussion, consider the following crude calculation of changing relative gross national product. The population of England grew by approximately 280 per cent between 1550 and 1820 while the population of western Europe minus England grew by about 80 per cent. All the major countries of continental western Europe grew by roughly similar percentages over this period.<sup>5</sup> Attempting to estimate changes in output per head over

<sup>3</sup>The concept of an organic economy is described in E.A. Wrigley, *Continuity, Chance and Change: the Character of the Industrial Revolution in England* (Cambridge, 1988), 17–32.

<sup>4</sup>In a more extended discussion of this question, it would be necessary to take into account the complex issues associated with the extension of English power within the British Isles and, especially towards the end of the period, the acquisition of colonies on other continents. Hence the qualification implied by using the adverb 'principally'.

<sup>5</sup>E.A. Wrigley, 'The Growth of Population in Eighteenth-Century England: a Conundrum resolved', *Past and Present*, 98 (1983), 121–5. Countries such as Italy or Germany were not, of course, united political entities in this period. Even those, such as France, which were already nation states in the sixteenth century experienced boundary changes

the same period is subject to much wider uncertainties than the estimate of population change, but it seems certain that the pace of increase was higher in England than elsewhere. Maddison's calculations suggest that in 1820 English output per head was about 40 per cent higher than that of France or Holland and even further ahead of that of continental Europe as a whole.<sup>6</sup> If, for argument's sake, we assume that there was little difference between England and the continent in the mid-sixteenth century, the implication of this exercise is that the gross national product of England was three times larger relative to that of continental countries by the end of the period than it had been at its beginning.<sup>7</sup> An exercise of this kind is subject to many uncertainties, and can make no claim to precision. The result, however, is as likely to understate as to overstate the relative economic advance of England. In any case it leaves no room for doubt that her relative advance was exceptional. How did it come about?

A first point to stress is that the relative advance was in train long before the period which has conventionally been assigned to the

during the early modern period. The estimated growth rates are intended to refer to the areas now occupied by the states in question, though all are subject to significant margins of error.

<sup>6</sup>At first sight Maddison's work does not suggest large differences among England and advanced continental countries at the beginning of the nineteenth century. For example, his estimates of gross domestic product per head in 1820 for France, the Netherlands, and the United Kingdom fall within quite a narrow range: that for France (expressed in 1970 US dollars) is \$377, for the Netherlands \$400, and for the United Kingdom \$454. But the UK figure includes Ireland, and Maddison estimated Irish output per head at only half the British figure. Since Irish population was 32.6 per cent of the UK total in 1821, this implies that the British figure for GDP per head would be \$542 rather than \$454, or 36 per cent higher than the Dutch and 44 per cent higher than the French, rather than 14 and 20 per cent as suggested by a comparison using UK GDP estimates. Since Scottish output per head was lower than English, a figure for England only would be still higher and the advantage over France and the Netherlands therefore still more pronounced: A. Maddison, *Phases of Capitalist Development* (Oxford, 1982), tab. 1.4, 8 and 167; B.R. Mitchell, *British Historical Statistics* (Cambridge, 1988), tab. 1.2, 9–10. Unless Maddison's work can be shown to be deeply flawed, therefore, the scale of the contrast between England and other European countries at the end of the early modern period suggests a substantially different structure of aggregate demand in England, and reinforces the likelihood of a distinctive prior history. If data for European countries other than France and the Netherlands were available, the contrast would, in general, be still more pronounced.

<sup>7</sup>To be more concrete, by way of illustration, suppose that output per head in a 'typical' continental country rose by one-third between 1550 and 1820 and that its population increased by 80 per cent, then its gross national product would have risen by about 140 per cent ( $1.33 \times 1.8 \times 100 = 239$ ). Over the same period the English population rose by 280 per cent and we have made the assumption that its output per head moved from parity with a continental average in 1550 to an advantage of 40 per cent by 1820. Therefore gross national product would have risen by about 600 per cent ( $(1.33 \times 1.4) \times 3.8 \times 100 = 708$ ). And  $708/239 = 2.96$ , or approximately a threefold relative increase.

industrial revolution. The change was cumulative and progressive rather than abrupt. It was largely the product of developments within the period often termed pre-industrial; the period when the land was the source not simply of the food of the nation but of the great bulk of its raw materials also, and when therefore the productivity of the land was the key to the possibility of increasing the output of material goods: the period of an organic economy.

Since an almost exclusive emphasis on the land as the source of the material products needed to satisfy human wants is an unfamiliar idea today, it may be helpful to exemplify the point somewhat. Many of the largest industries of the twentieth century are freed from any dependence on animal or vegetable raw materials. Capital goods are constructed predominantly from metal, concrete, and bricks. Most consumer durables are made from metal or plastics. Ceramics and glass are widely used and are produced in great quantity. Transport vehicles, ships, planes, trains, lorries, and cars are made of metal, plastics, and glass. Even articles of clothing, once made exclusively from vegetable or animal raw materials, are now often made from nylon, polyester, or similar materials. Footwear is no longer exclusively made from leather. The supply of mineral ores, clays, oil, and coal, the raw materials from which so many products are manufactured, is not unlimited. Some may become exhausted in the foreseeable future. All must eventually be worked out or at least become increasingly inaccessible. Converting them for human use entails expending a huge quantity of energy. This, too, in time may give rise to grave difficulties, either because no cheap and effective alternative to fossil fuels is developed, or because of the pollution to which their use gives rise. But all such problems are quite different from those which faced organic economies.

The nature of such economies is immediately suggested by their employment structures. In England the most numerous employment groups outside agriculture even as late as 1831 were trades such as shoemakers, carpenters, tailors, blacksmiths, masons, butchers, bricklayers, and bakers, or service occupations such as publicans and shopkeepers.<sup>8</sup> A couple of centuries earlier, if equivalent information were available, it is unlikely that shopkeepers or bricklayers would have been so prominent, but the other occupations, though many fewer in absolute number, would have retained much the same relative positions.

<sup>8</sup>These ten occupations were the largest in the general category of 'handicraft and trade' at the taking of the 1831 census: E.A. Wrigley, 'Men on the Land and Men in the Countryside: Employment in Agriculture in Early-Nineteenth-Century England', in *The World We Have Gained: Histories of Population and Social Structure*, eds. L. Bonfield, R.M. Smith and K. Wrightson (Oxford, 1986), tab. 11.2, 300–1. The list of trades is shown in descending order of size. If all ten occupations were to be treated as a single list, publicans would rank fourth and shopkeepers fifth in size.

With the exception of masons, all these were occupations which depended on animal or vegetable raw materials either as inputs into the production process or, in the case of the service occupations, as the ultimate source of the material goods which they were making available to the public. Blacksmiths and bricklayers were only apparent exceptions to the rule, since the smelting of metals and the baking of bricks were traditionally dependent upon wood as a fuel source, and this was the reason for the modest scale of the output from iron foundries or brickworks in the pre-industrial era. The first stirrings of change in regard to fuel supply, however, were already taking place in early modern England, a development which will require further examination in due course.

If, for simplicity's sake, and as a first approximation, it is agreed that England for most of the early modern period may be regarded as an organic economy, then the nature of the limitation imposed upon it, in common with all other such economies, is clear. All animal and vegetable life is ultimately dependent upon photosynthesis, the process by which a small fraction of the incident energy pouring down upon the earth each year from the sun is converted into a form which either itself constitutes life or affords a basis for other life forms. Animate life is normally in a sense a zero sum game. A square kilometre of forest occupied by pine trees cannot also sustain oaks. A tribe of neanderthals who succeed in securing the bulk of the annual 'crop' of deer will put pressure on a local wolf population which had been heavily dependent upon deer for its food. Symbiosis greatly complicates any such oversimple picture but there is nonetheless a substantial element of truth in viewing competition for the finite products of photosynthesis as a defining feature of animate life. Organic economies constantly juggled with the same problem. Fodder for livestock represented the product of land which might otherwise have been used to grow food for people. The woollen industry could not expand indefinitely without limiting wheat output. Sheep did eat up men.

This point underlies the well-known principle, formulated to greatest effect by Ricardo, which has come to be known as the law of diminishing returns. This principle follows directly from the nature of any organic economy. If the base of all material production lies in the process of photosynthesis and the land surface is finite, there must be limits to the expansion of the quantity of raw materials which can be made available to mankind. The neolithic food revolution, by substituting plants of use to man for the natural vegetation cover, vastly increased the proportion of the products of photosynthesis annexed by man for his own use at the expense of those plants and animals which did not serve his purposes. But once the limits of convenient cultivation had been reached, additional output had either to be won from soils rendered

relatively infertile by altitude, steep slope, or poor drainage; or from the more intensive farming of land already in cultivation. In either case, so Ricardo argued, each additional unit of output could be secured only by an increasing proportional input of labour, or capital, or both. As a result the returns to capital and labour must both fall and, at some point, further expansion would become impossible.<sup>9</sup>

All organic economies faced these difficulties, but England proved exceptionally adept at overcoming them. It is a crude but convincing measure of the extent of her achievement to note that by the beginning of the nineteenth century, when the country was still largely self-sufficient in food, only about 40 per cent of the adult male labour force was engaged in agriculture, whereas in continental Europe the comparable figure characteristically ranged between 60 and 80 per cent.<sup>10</sup> An unusually small proportion of the labour force in agriculture, of course, also implies an unusually large proportion in secondary industry and tertiary occupations. Or again, in 1800 England was the most heavily urbanised country in Europe other than Holland, even though in the mid-sixteenth century she had been amongst the least urbanised.<sup>11</sup> London became the largest city in Europe during the seventeenth century.<sup>12</sup> Urban growth in England accelerated so dramatically that during the second half of the eighteenth century 70 per cent of all the urban growth taking place in Europe as a whole occurred in England alone, even though the population of England was only about 8 per cent of that of Europe.<sup>13</sup> Gregory King had been concerned about the ability of England to provide a strong enough tax base to sustain a prolonged conflict with France or Holland, the two countries

<sup>9</sup>For a fuller discussion of the treatment of this issue by the classical economists, Adam Smith, Ricardo, and Malthus, see E.A. Wrigley, 'The Classical Economists and the Industrial Revolution', in *idem*, *People, Cities and Wealth: the Transformation of Traditional Society* (Oxford, 1987), 21–45.

<sup>10</sup>In Finland in 1805 82.1 per cent of the total labour force was engaged in agriculture. In Italy in 1871 61.2 per cent of the male labour force was in agriculture, and the comparable percentages in Ireland (1841) and Sweden (1860) were 68.5 and 64.6. The percentages for Italy, Ireland, and Sweden would certainly have been higher at the beginning of the nineteenth century. In England in 1800 comparable percentage was only about 38 per cent. Mitchell, *British Historical Statistics*, tab. C1, 161–73; Wrigley, 'Men on the Land', tab. 11.12, 332.

<sup>11</sup>J. de Vries, *European Urbanization 1500–1800* (Cambridge, Mass., 1984), tab. 3.2, 30; tab. 3.6, 36–7. Also E.A. Wrigley, 'Urban Growth and Agricultural Change: England and the Continent in the Early Modern Period', *Journal of Interdisciplinary History*, xv (1985), 683–728.

<sup>12</sup>The population of London in 1600, 1700, and 1800 was approximately 200,000; 575,000; and 865,000; the population of Paris, her chief rival in size, at the same three dates was 220,000; 430,000; and 581,000; de Vries, *European Urbanization*, app. 1, 269–78.

<sup>13</sup>Wrigley, 'Urban Growth', tab. 7, 709.

whose power gave most concern to Englishmen in his day.<sup>14</sup> Yet the course of events in the eighteenth century showed that the English economy was able to cope with a substantially heavier tax burden, both in times of peace and war, than that imposed by the French government. Moreover, the weight of taxation did not prevent a continued and sustained expansion of the economy contrary to the fears expressed by King and many others.<sup>15</sup>

Although no comprehensive agricultural production statistics are available until well into the nineteenth century, it may be taken as certain not only that there was a very large rise in the output of English agriculture between the late sixteenth and the early nineteenth centuries, but also that output per head increased greatly.<sup>16</sup> The first point follows directly from the fact that the population tripled while the country remained broadly self-sufficient in basic foodstuffs.<sup>17</sup> The second follows from the first if combined with the probability that the workforce engaged in agriculture increased only slightly between 1600 and 1800.<sup>18</sup> The second point is the more remarkable of the two since it signifies that for a quarter-millennium England succeeded in escaping from the ineluctable pressures which Ricardo had described.<sup>19</sup>

<sup>14</sup> See, for example, G. King, *Natural and Political Observations and Conclusions upon the State and Condition of England 1696*, reprinted in *The Earliest Classics: John Graunt and Gregory King*, with an introd. by P. Laslett (Gregg International, 1973), 227–30. His concern with this issue surfaces repeatedly in the many calculations reproduced from his notebooks in this work.

<sup>15</sup> An extended discussion of the scale of the tax burden in England, of its nature, and of the relation between the tax yield and military success, together with a comparison of England and her main rivals, France and the Dutch Republic, in these respects, may be found in Brewer, *The Sinews of Power*. See also P.K. O'Brien, 'The Political Economy of British Taxation, 1660–1815', *Economic History Review*, 2nd ser., xli (1988), 1–32 and P. Mathias and P.K. O'Brien, 'Taxation in England and France 1715–1810', *Journal of European Economic History*, 5 (1976), 601–50.

<sup>16</sup> Official series for agricultural acreages and livestock numbers for Great Britain began in 1867, though production series are available only from 1885. Mitchell, *British Historical Statistics*, section III.

<sup>17</sup> Nor was the population ill nourished. There is persuasive evidence that the English population was better nourished than populations in continental Europe at the end of the eighteenth century, though much less well fed than those who lived in the newly independent United States. R.W. Fogel, 'The Conquest of High Mortality and Hunger in Europe and America: Timing and Mechanisms', *Working Paper Series on Historical Factors in Long Run Growth*, no. 16, National Bureau of Economic Research (Cambridge, Mass., 1989), tab. 4, 30 and fig. 5, 38.

<sup>18</sup> Wrigley, 'Urban Growth', tab. 4, 700–1.

<sup>19</sup> It is relevant to note in this connection, however, that unlike many other European countries, the population of England in 1600 was probably still substantially smaller than it had been at its medieval peak at the beginning of the fourteenth century. In 1600 the population was approximately 4.2 million; c.1300 it is widely thought to have exceeded 6 million. The pressure of population on agricultural resources may therefore have been significantly less pronounced in early seventeenth-century England than in many other

How should one seek to explain this phenomenon? In an extended discussion of this issue it would be natural to begin by reviewing in detail the changes which occurred. For example, there is clear evidence that cereal yields doubled between c.1600 and c.1800. This change, combined with the fact that new rotational systems made it possible to reduce the proportion of the land which was fallowed from perhaps 30 per cent of the arable area at the beginning of the period to a figure of about 12 per cent at its end, goes far towards establishing the proximate reasons for the country's ability to cope with a growing population without any large percentage increase in the area in cultivation.<sup>20</sup> Or again, the nitrogen content of the soil is now widely seen as the key immediate determinant of crop yields. The introduction of leguminous plants into crop rotations helped in this connection both directly by the fixing of nitrogen in their root systems and indirectly by enabling a larger livestock population to be sustained and hence a larger quantity of nitrogen in the form of animal manure to be returned to the soil. Since there is a trade-off between the number of draught animals available on the farm and the number of men whom it is necessary to employ, and it is demonstrable that the ratio of draught animals to men in agricultural employment was substantially higher in England than in France, a part of the rise of manpower productivity

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countries and population growth may have been accommodated more easily. For the population in 1600: E.A. Wrigley, R.S. Davies, J.E. Oeppen and R.S. Schofield, *English Population History from Family Reconstitution 1580–1837* (Cambridge, 1997), tab. Ag.1, 614–15. The size of the population 300 years earlier is subject to much wider margins of uncertainty, but Smith concluded, after a critical review both of the available empirical evidence and of the views of leading scholars, that they strongly suggested 'that the English population total prior to 1310 is very unlikely to have been less than 5.0 million and most probably exceeded 6.0 million': R.M. Smith, 'Demographic Developments in Rural England, 1300–48', in *Before the Black Death: Studies in the 'Crisis' of the Early Fourteenth Century*, ed. B.M.S. Campbell (Manchester, 1991), 49. He noted that this may imply that not until the 1760s was the medieval peak exceeded (50). There are, however, those who stand out against the consensus. Campbell *et al.*, for example, basing their view on the area sown to grain crops each year, net yield per acre, and assumptions about average calorie intake, conclude that the population of England may have been no higher than between 3.4 and 5.6 million and make it clear that their sympathies lie with a figure towards the lower end of the range: B.M.S. Campbell, J.A. Galloway, D. Keene, and M. Murphy, *A Medieval Capital and its Grain Supply: Agrarian Production and Distribution in the London Region c.1300*, Historical Geography Research Series no. 30 (1993), 43, and, more generally, 37–45.

<sup>20</sup> The figure of 30 per cent for the sixteenth century is probably an underestimate. In different parts of the country arable land was fallowed every second, every third, or every fourth year. The overall figure is therefore a function of the relative importance of the three different predominant rotations. The position is much clearer for the beginning of the nineteenth century when the data available in the county surveys suggests that the ratio of fallow to crops was about 1:7. B.A. Holderness, 'Prices, Productivity, and Output' in *The Agrarian History of England and Wales*, vi, 1750–1850, ed. G.E. Mingay (Cambridge, 1989), 133.



taking place in England can probably be attributed to an increase in this ratio.<sup>21</sup> An abundance of draught animals also makes it more readily possible to perform the large number of ton-miles of effort needed if lime and marl are to be applied assiduously to improve soil quality.<sup>22</sup> However, since this discussion must be brief, I intend to concentrate upon some wider issues that are repeatedly raised when attempting to specify the features of English society and economy that gave the country for a time a marked advantage over neighbouring countries.

The first point to consider is whether what happened in England was *sui generis*, or whether there were precedents for it. The question can be made more explicit. In what respects, if any, were developments in England in the seventeenth and eighteenth centuries different from those which took place in Holland in the sixteenth and seventeenth centuries? Was English success merely Dutch success writ large because of greater resources and a bigger population? Holland in its heyday had developed a productive commercial agriculture; had urbanised to the same extent as that attained by England about 1800; had achieved dominance of the international oceanic carrying trade; had succeeded in raising Dutch real incomes to a level substantially higher than that of her rivals; and had enjoyed technical superiority in many branches of manufacture. Yet the momentum of growth in the Dutch republic had faded before the end of the seventeenth century, giving way during the eighteenth to a lengthy period of virtual stagnation. Alone among the nations of western Europe the population of Holland failed to grow during the eighteenth century and her economy ceased to expand.<sup>23</sup> The standard of living did not plummet. Real wages fell moderately during the eighteenth century, but they remained higher than those of most other European countries.<sup>24</sup> The Dutch economy, however, ceased to display what is often taken as a defining characteristic of a modern economy, that over any considerable period both gross output and output per head will rise. In this respect, English experience was different since the two centuries of expansion before 1800 were followed not by stagnation but by a further acceleration in the rate of growth. Focusing on this feature of English experience compared with Dutch points to a distinctive aspect of the divergence of England. It also makes it possible to approach a question of fundamental importance in shaping

<sup>21</sup> E.A. Wrigley, 'Energy Availability and Agricultural Productivity', in *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, eds. B.M.S. Campbell and M. Overton (Manchester, 1991), 323–39.

<sup>22</sup> Wrigley, *Continuity, Chance and Change*, 43–4.

<sup>23</sup> J. de Vries and A. van der Woude, *The First Modern Economy: Success, Failure and Perseverance of the Dutch Economy, 1500–1815* (Cambridge, 1997), 665–93.

<sup>24</sup> *Ibid.*, 627–32.

our view of the nature of the modern world, since it is inextricably intertwined with the related question of the propriety of treating the development of capitalism as a valid explanation of the unprecedented economic dynamism of west European countries in this period.

The question at issue is whether the very nature of the capitalist system, which had developed greatly in the seventeenth and eighteenth centuries, ensured that growth would be constant and progressive, if at times productive of severe hardship and social tension, or whether capitalist economies, on the model of eighteenth-century Holland, might enter a phase of stagnation, which might prove as long lasting as any previous period of expansion, or even possibly indefinite. If the former were the case, the whole sequence of growth from Tudor times to Edwardian England and beyond may be seen as a unitary phenomenon, each phase a natural, even an inevitable development from earlier phases. If the Dutch case is not treated simply as an aberration, however, the advent of capitalism is not in itself a sufficient explanation of the course of events.

Since the chances of securing exponential growth may appear very differently *ex prae facto* from *ex post facto*, it is illuminating both to consider the views of contemporaries and of more recent scholarship in this connection.

Adam Smith considered the sources of growth and the limits to growth at length, often turning to Holland in the course of his discussion of the question. He opened the *Wealth of Nations* by analysing with great clarity the possibilities for increasing productivity per head afforded by the division of labour, and then explained the close connection between gains achieved in this fashion, the extent of the market, and the scale of capital accumulation. The example which he chose to illustrate the scope for productivity gains has subsequently acquired the status of a secular parable. He asserted that 20 pinmakers combining to maximise the efficiency of pin production were capable of raising productivity per head 240 times when compared with what a single pinmaker could achieve operating on his own.<sup>25</sup> Even when allowance is made for the fact that he regarded the comparable opportunities in agriculture, by far the largest employer of labour, as slighter,<sup>26</sup> the world which he depicts might appear to offer immense opportunities for progressive gains in productivity, intimately connected with capitalist enterprise. But Adam Smith himself saw matters differently. He was convinced that opportunities for raising production per head were finite and limited, remarking:

<sup>25</sup> A. Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, ed. E. Cannan, 2 vols. (Chicago, 1976), 1, 8–9.

<sup>26</sup> *Ibid.*, 1, 9–10.

In a country which had acquired that full complement of riches which the nature of its soil and climate, and its situation with respect to other countries, allowed it to acquire; which could, therefore, advance no further, and which was not going backwards, both the wages of labour and the profits of stock would probably be very low.<sup>27</sup>

Although Smith did not suppose any country had yet reached this state, it is clear that he believed that Holland was close to it. It had largely exhausted the range of opportunities for profitable local investment. Smith, using the prevailing interest rate as a surrogate measure of the return on capital, noted that in Holland the government could borrow at 2 per cent and individuals of good credit at 3 per cent and remarked that 'the diminution of profit is the natural effect of its prosperity [that is, the prosperity of Holland], or of a greater stock being employed in it than before'.<sup>28</sup> With investment opportunities so limited close to home, and capital abundant and cheap, Dutch capitalists increasingly turned to other countries and to the carrying trade.<sup>29</sup> Smith, in other words, in common with the other great classical economists, Malthus and Ricardo, envisaged growth as giving way eventually to what they termed the stationary state, an unpromising situation in which neither those who depended on their labour for a livelihood, nor those who depended on capital, were well rewarded for their contributions to the production process.<sup>30</sup> In short, Adam Smith not only regarded it as possible that the advent of capitalism might, after a period of growth and prosperity, be followed by a much darker situation, but expected that the very dynamism of the capitalist system in seeking out opportunities for profitable investment must eventually bring about the stationary state. On this view, what happened subsequently in England was against all expectation.

That Smith's pessimism was unjustified is plain. Rather than deceleration occurring, later generations experienced rates of growth without precedent. Before the nineteenth century the low level of productivity

<sup>27</sup> *Ibid.*, 1, 106.

<sup>28</sup> *Ibid.*, 1, 102.

<sup>29</sup> 'The carrying trade,' he remarked, 'is the natural effect and symptom of great national wealth; but it does not seem to be the natural cause of it.' *Ibid.*, 1, 395. See also *ibid.*, 1, 108.

<sup>30</sup> Labour and capital could both enjoy good returns during the phase of expansion made possible by the division of labour, an extensive market, and a steadily rising supply of capital, but this would not last. Smith wrote, 'It is in the progressive state, while the society is advancing to the further acquisition, rather than when it has acquired its full complement of riches, that the condition of the labouring poor, of the great body of the people, seems to be the happiest and most comfortable. It is hard in the stationary, and miserable in the declining state.' *Ibid.* 1, 90-1.

per head universally experienced in fully settled countries meant that the idea of abolishing poverty was a utopian dream. By the end of the century, this possibility no longer seemed out of reach. The outrage expressed by Marx that the means of production existed to enable poverty to be abolished, but that the vastly increased flow of wealth was being concentrated in fewer and fewer hands, fired socialist politics for several generations. The classical economists proved mistaken in their forebodings, but perhaps they were mistaken not from any flaw in their logic, but because, as so often in history, events took a turn for which there was no precedent and which was therefore impossible to foresee.

The other classical economists followed Adam Smith's lead, adducing additional arguments in reaching the same conclusion. Malthus, though in his later years less pessimistic than Smith about the future, was nevertheless oppressed by the thought of what must follow if a rising population bore harder and harder on a fixed and limited supply of land.<sup>31</sup> Ricardo, in formulating the doctrine of declining marginal returns, was the most categorical of all in ruling out any possibility of a prosperous future for mankind, insisting that the problem ultimately arose from the laws of nature rather than the dispositions of man:

Whilst the land yields abundantly, wages may temporarily rise, and the producers may consume more than their accustomed proportion; but the stimulus which will thus be given to population will speedily reduce the labourers to their usual consumption. But when poor lands are taken into cultivation, or when more capital and labour are expended on the old land, with a less return of produce, the effect must be permanent. A greater proportion of that part of the produce which remains to be divided, after paying rent, between the owners of stock and the labourers, will be apportioned to the latter. Each man may, and probably will, have a less absolute quantity; but as more labourers are employed in proportion to the whole produce retained by the farmer, the value of a greater proportion of the whole produce will be absorbed by wages, and consequently the

<sup>31</sup> Malthus' model of the characteristic behaviour of an economy included long-term 'oscillations' during which for considerable periods of time the secular tendency of real wages might be either upwards or downwards. During an upswing, as he envisaged the matter, one of two results were possible: 'one, that of a rapid increase in population, in which case the high wages are chiefly spent on the maintenance of large and frequent families; and the other, that of a decided improvement in the modes of subsistence, and the conveniences and comforts enjoyed, without a proportionate acceleration in the rate of increase'. In the latter case, the benefits accruing were not necessarily dissipated by excessive population growth but might facilitate the establishment of a new and higher plateau of living standards. T.R. Malthus, *Principles of Political Economy*, 2nd edn. (1836) in *The Works of Thomas Robert Malthus*, ed. E.A. Wrigley and D. Souden (1986), v, 183.

value of a smaller proportion will be devoted to profits. This will necessarily be rendered permanent by the laws of nature, which have limited the productive powers of the land.<sup>32</sup>

The event which escaped contemporary notice was the coming into existence alongside the organic economy of a new and different economy based not on the produce of the land, and thus ultimately on the limits set by the annual quantum of photosynthesis, but on minerals and on fossil fuels which, in contrast to output derived from the soil, were not necessarily subject to declining marginal returns. Production in this mode could be expanded immensely, and often enjoyed increasing marginal returns. Negative feedback could be replaced by positive feedback. But was the course taken by events implied by the very nature of the new economic system, the capitalist system, which had grown up in the past two or three centuries, or might capitalist economies, as Adam Smith supposed, pass from growth to stagnation? To express the same idea using differing terminology, was capitalist growth intrinsically exponential or might it equally well be asymptotic?

There can be no final resolution of this issue, given its nature and the uncertainties which surround it. Yet, since the answer to these questions must affect our appreciation of the nature of capitalism, they cannot be ignored. Marx, whose influence has been pervasive both among those who have shared his political views and among those who have not, may be taken as the weightiest advocate of the former view. A capitalist economy, in his analysis, moved inevitably from the handicraft period through manufacture to modern industry. Manufacture developed out of the handicraft system either 'from the union of various independent handicrafts, which become stripped of their independence and specialised to such an extent as to be reduced to mere supplementary partial processes in the production of one particular commodity' or because it split up a 'particular handicraft into its various detail operations, isolating, and making these operations independent of one another up to the point where each becomes the exclusive function of a particular labourer. – But whatever may have been its particular starting-point, its final form is invariably the same – a productive mechanism whose parts are human beings.'<sup>33</sup> During the manufacturing period machinery played only a subordinate role to the

<sup>32</sup>D. Ricardo, *On the Principles of Political Economy and Taxation* in *The Works and Correspondence of David Ricardo*, 1, ed. P. Sraffa with the collaboration of M.H. Dobb (Cambridge, 1951), 125–6.

<sup>33</sup>K. Marx, *Capital: a Critical Analysis of Capitalist Production*, ed. F. Engels, trans. S. Moore and E. Aveling from the 3rd German edn. (2 vols., 1887), 1, 329.

division of labour in securing more efficient production.<sup>34</sup> It was an organisational form rather than a particular embodied technology which defined manufacture. Such an organisational form required the concentration of larger and larger amounts of capital in the hands of capitalist entrepreneurs, converting the labourer into what Marx termed 'a crippled monstrosity'.<sup>35</sup> 'As the chosen people bore in their features the sign manual of Jehovah,' he concluded, allowing himself a flight of fancy, 'so division of labour brands the manufacturing workman as the property of capital.'<sup>36</sup>

The critical difference between the era of manufacture and the era of modern industry, in Marx's eyes, lay in the nature of the machine. The capitalist strives constantly to reduce production costs because, by shortening that fraction of the working day in which the labourer works for himself, that is to supply his maintenance, the fraction of the day during which he works for the capitalist is increased.<sup>37</sup> 'In short,' as Marx put it, 'it is a means of producing surplus-value.'<sup>38</sup> The emphasis shifts from labour power itself to the instruments of labour. The crucial distinction, between the two eras, in his view was that between a tool and a machine. 'The machine proper is therefore a mechanism that, after being set in motion, performs with its tools the same operations that were formerly done by the workman with similar tools. Whether the motive power is derived from man, or from some other machine, makes no difference in this respect. From the moment that the tool proper is taken from man, and fitted into a mechanism, a machine takes the place of a mere implement.'<sup>39</sup> He explicitly rejected the view that the crucial distinction had to do with motive power. He noted that it had been argued that in the case of a tool the motive power was supplied by the worker himself whereas in the case of a machine the motive power was supplied by an animal, the wind, or a water fall, but he suggested, as an insuperable obstacle to this view, that it would entail accepting that production by machinery preceded production by handicraft, since animals had been used to provide mechanical energy in the production process from a very early date.<sup>40</sup> Elaborating the same point, he wrote,

<sup>34</sup> 'But, on the whole, machinery played that subordinate part which Adam Smith assigns to it in comparison with the division of labour.' What Marx termed the 'collective labourer, formed by the combination of a number of detail labourers' was 'the machinery specially characteristic of the manufacturing period.' *Ibid.*, I, 341.

<sup>35</sup> *Ibid.*, I, 354.

<sup>36</sup> *Ibid.*, I, 355.

<sup>37</sup> *Ibid.*, II, 365.

<sup>38</sup> *Ibid.*, II, 366.

<sup>39</sup> *Ibid.*, II, 368.

<sup>40</sup> *Ibid.*, II, 366.

The steam-engine itself, such as it was at its invention, during the manufacturing period at the close of the 17th century, and as it continued to be down to 1780, did not give rise to any industrial revolution. It was on the contrary, the invention of machines that made a revolution in the form of steam-engines necessary. As soon as man, instead of working with an implement on the subject of his labour, becomes merely the motive power of an implement-machine, it is a mere accident that motive power takes the disguise of human muscle; it may equally well take the form of wind, water or steam.<sup>41</sup>

For Marx, therefore, the transition between manufacture and modern industry was unproblematic. The nature of capitalism determines the characteristics of both economic systems and ensures that there will be a transition from one to the other. The technological changes which occurred were equally unproblematic since they were induced by the necessities of the two systems. Capitalism, unlike any earlier socio-economic form, brought into being a dominant class whose nature committed them to promoting changes which tended to increase productivity. 'The bourgeoisie,' he wrote, 'cannot exist without constantly revolutionising the instruments of production, and thereby the relations of production, and with them the whole relations of society. Conservation of the old modes of production in unaltered form, was, on the contrary, the first condition of existence for all earlier industrial classes.'<sup>42</sup> There was a continuum between the forces which had first turned independent craftsmen into what would now be termed a proto-industrial workforce and those which substituted powered machinery for hand-held tools.<sup>43</sup>

Marx's conviction that development was essentially continuous has been echoed by many others. One of the two economic historians to be awarded a Nobel prize in 1993, Douglass North, for example, comes to the same conclusion, though by a different route. Since he regards change in institutional structures as the key development which made possible a capitalist economy and facilitated rapid and persistent economic growth, he focuses on the importance of the appearance of a legal framework within which rational decisions can be taken and implemented and treats the subsequent growth, whether occurring

<sup>41</sup>Ibid., II, 370. Finally, in summary, he wrote, 'The machine, which is the starting point of the industrial revolution, supersedes the workman, who handles a single tool, by a mechanism operating with a number of similar tools, and set in motion by a single motive power, whatever the form of that power may be.' Ibid., II, 370-1.

<sup>42</sup>K. Marx and F. Engels, *The Communist Manifesto*, trans. S. Moore (London and Chicago, 1996), 16.

<sup>43</sup>Marx's manufacturing phase closely resembles the proto-industrial period as defined by Mendels, who coined the term. F.F. Mendels, 'Proto-Industrialization: the First Phase of the Industrialization Process', *Journal of Economic History*, xxxII (1972), 241-61.

before or after the changes which we term the industrial revolution, as essentially downstream from the creation of such a framework. 'The technological change associated with the industrial revolution required the *prior* development of a set of property rights, which raised the private rate of return on invention and innovation.'<sup>44</sup> Further, 'our stereotyped views of the industrial revolution are in need of revision. The period that we have come to call the industrial revolution was not the radical break with the past that we sometimes believe it to have been. Instead, – it was the evolutionary culmination of a series of prior events.'<sup>45</sup> Or again, 'The most convincing explanation for the industrial revolution as an acceleration in the rate of innovation is one drawn from straightforward neoclassical theory in which a combination of better specified and enforced property rights and increasingly efficient and expanding markets directed resources into new channels.'<sup>46</sup>

The list of those taking a similar view of the continuity in the nature of change before, during, and after the industrial revolution could be extended almost indefinitely. The increasingly clear consensus amongst economic historians intent on measuring aggregate economic growth that any acceleration which took place during the classic period of the industrial revolution was minor has tended to underwrite this viewpoint.<sup>47</sup>

<sup>44</sup>D.C. North, *Structure and Change in Economic History* (New York, 1981), 147. The same, he argued, had been true of the earlier growth surge in the Netherlands. 'The merchants of the Low Countries in recognition of this situation paid their rulers through the States General to establish and enforce property rights and end restrictive practices. The Netherlands as a result became the first country to achieve sustained economic growth.' *Ibid.*, 154.

<sup>45</sup>*Ibid.*, 162.

<sup>46</sup>*Ibid.*, 166. Further, 'Particularly significant to the developing of more efficient markets, however, is the better specification and enforcement of property rights over goods and services; and in many cases much more was involved than simply removing restrictions on the mobility of capital and labour – important as those changes were. Private and parliamentary enclosures in agriculture, the Statute of Monopolies establishing a patent law, and the immense development of a body of common law to better specify and enforce contracts are also part of the story.' *Ibid.*, 167. Or again, '– an increase in the rate of technological progress will result from either an increase in the size of the market or an increase in the inventor's ability to capture a larger share of the benefits created by his invention'. *Ibid.*, 165–6.

<sup>47</sup>There is an enormous literature on this issue and a substantial remaining dispute about the weights to be attached to individual output series and the best methods of dealing with sectors of the economy, such as services, for which the direct empirical evidence is very limited. It is symptomatic of the scale of the revision which has taken place that Crafts, who has been a leading figure in urging the case for much more modest estimates of growth rates, concluded that in none of the four sub-periods into which he divided the period 1700–1830 did the rate of growth of national product per head exceed 0.5 per cent per annum and in one period (1760–80) he estimated that there was no increase at all in this figure, a very marked contrast with the earlier estimates of Deane and Cole. N.F.R. Crafts, *British Economic Growth during the Industrial Revolution*



The 'traditional' view that the industrial revolution represented a marked discontinuity with the past and that it occurred during the later decades of the eighteenth century and the early decades of the nineteenth century has not, however, disappeared from recent literature on the subject. Few scholars have taken a more wide-ranging interest in the question than Mokyr. He leaves no doubt about his view of the importance of the industrial revolution. 'Examining British economic history in the period 1760–1830 is a bit like studying the history of the Jewish dissenters between 50 B.C. and 50 A.D. At first provincial, localized, even bizarre, it was destined to change the life of every man and woman in the West beyond recognition and to affect deeply the lives of others . . .'.<sup>48</sup> And Mokyr is explicit that capitalism alone is no guarantee of change as fundamental as that which occurred in Britain in this period. 'Holland,' he pointed out, 'was an urban, capitalist, bourgeois society, indicating that having the "right kind of society" is not a sufficient condition for a successful Industrial Revolution.'<sup>49</sup> Nor does he accept the kind of argument advanced by North, once again by drawing attention to the Dutch case.<sup>50</sup>

To dispose of one common source of misunderstanding about the industrial revolution, and to underline its transformative power, Mokyr undertook two simple modelling exercises. The first relates to the absence of a sharp acceleration in *aggregate* growth rates during the 'classic' period of the industrial revolution. If there is a small 'modern' sector of the economy with a very high growth rate and a much larger 'traditional' sector where the growth rate is low, it will take a long time for the former to contribute sufficiently to the overall growth rate to produce a marked general acceleration. For example, if, at a given date, the modern sector comprises 10 per cent of the whole and is growing at 4 per cent per annum, while the remainder, the traditional sector, is growing at 1 per cent per annum, the combined growth rate will be 1.3 per cent per annum. Assuming that both sectors continue to grow at the stated rates, it will take 74 years for the two sectors to become of equal size, at which point the overall growth rate will have increased to no more than 2.5 per cent per annum.<sup>51</sup> The second

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(Oxford, 1985), tab. 2.11, 45. On the potential significance of the services sector in this context, see R.V. Jackson, 'Government Expenditure and British Economic Growth in the Eighteenth Century: some Problems of Measurement', *Economic History Review*, 2nd ser., XLIII (1990), 217–35.

<sup>48</sup>J. Mokyr, 'Editor's Introduction: the New Economic History and the Industrial Revolution', in *The British Industrial Revolution: an Economic Perspective*, ed. J. Mokyr (Boulder, San Francisco, Oxford, 1993), 131.

<sup>49</sup>*Ibid.*, 39.

<sup>50</sup>*Ibid.*, 44–5.

<sup>51</sup>*Ibid.*, 12.

exercise was designed to establish what might have happened to living standards if growth had continued within the constraints obtaining before the cluster of technological changes which Mokyr regards as the key to explaining what happened. He addressed the question by means of a counterfactual exercise assuming that there were no technological advances, that labour and resources changed at their actual historical rates, and that productivity growth was constrained to zero. He then made three different assumptions about the rate of capital accumulation. The result on the most optimistic assumption was an estimated fall in real income per head of 6 per cent between 1760 and 1830. On the least optimistic assumption the fall was 19 per cent. Mokyr gives reasons to suppose that his calculations probably understate the fall which would have taken place in the absence of an industrial revolution.<sup>52</sup> Both these econometric exercises and the more conventional arguments which he also deployed, therefore, confirmed Mokyr in his view that something exceptional took place in late eighteenth-century England.

It is noteworthy that the Dutch experience should have attracted attention both in Adam Smith's time and still at the end of the twentieth century. To Adam Smith the history of the Dutch Republic was his warrant for expecting growth rates generally to falter. To Mokyr it supplied good reasons to look for a feature peculiar to England to account for the industrial revolution. Recently two very distinguished economic historians have returned to the issue of the 'modernity' of the early modern Dutch economy and have delivered a clear verdict. Their work bears closely on the 'divergence of England' question, since de Vries and van der Woude are intent on demonstrating that in her 'golden age' Holland was subject to opportunities and constraints essentially similar to those which determine the behaviour of advanced economies in the twentieth century; that it was, indeed, in their phrase, the 'first modern economy'.

Four main criteria were employed by de Vries and van der Woude in deciding whether or not a 'modern' economy existed. They were:

1. that markets both for commodities and for the three factors of production, land, labour, and capital, should be reasonably free and cover the bulk of productive activity.
2. that agricultural productivity should be sufficiently high to support a complex social and occupational structure, thus making possible an extensive division of labour.
3. that the state should be attentive to property rights and freedom of movement and contract, while not neglecting the material needs of the bulk of the population.

<sup>52</sup> *Ibid.*, 119–20.

4. that a level of technology and organisation should exist capable of supporting a material culture of sufficient variety to sustain market-oriented consumer behaviour.<sup>53</sup>

The defining characteristics of what de Vries and van der Woude term a modern economy, therefore, are essentially those which might equally well be employed to define a capitalist economy, though they prefer to conduct their discussion in terms of modernity.<sup>54</sup> It is convenient briefly to summarise their key findings. Enumerating them will also underline the closeness of the parallels between the Dutch experience and events in England a century or so later.

That the economy of the Netherlands made extraordinary progress between the middle decades of the sixteenth century and c.1680 has never been in dispute. De Vries and van der Woude emphasize that, although the achievements of the Dutch Republic in commerce and industry have attracted most attention, agriculture was an equally dynamic sector of the economy. The physical output of Dutch agriculture was increasing on average by between 0.7 and 0.8 per cent per annum during the sixteenth and early seventeenth centuries.<sup>55</sup> Yields rose sharply, especially in the maritime zone where they were double the continental norm.<sup>56</sup> Output per worker engaged in agriculture was far in excess of the European average and this was the basis for a beneficial relationship between the agricultural sector and the rest of the economy.<sup>57</sup> These developments were a prerequisite for the rapid urban growth which took place in the Republic and for the transformation of the occupational structure of the country which anticipated that found in England by 150 years.<sup>58</sup> They insist on the immense benefits conferred on the Dutch economy through the creation of an excellent transport infrastructure and the availability of an abundance of cheap energy, again anticipating two of the main stimuli to growth

<sup>53</sup>De Vries and van der Woude, *First Modern Economy*, 693.

<sup>54</sup>I have discussed a very similar range of issues in E.A. Wrigley, 'The Process of Modernization and the Industrial Revolution in England', *Journal of Interdisciplinary History*, III (1972), 225–59.

<sup>55</sup>De Vries and van der Woude, *First Modern Economy*, 232.

<sup>56</sup>*Ibid.*, 230.

<sup>57</sup>They refer to 'the integral part it played through interaction with commercial and industrial activity in creating the dynamic qualities of the seventeenth-century economy'. *Ibid.*, 195.

<sup>58</sup>The percentages in agriculture, industry, and other forms of employment in the Netherlands in the eighteenth century are given by de Vries and van der Woude as 41, 32, and 27, which may be compared with figures of 36, 30, and 34 for England for the same categories in 1801. *Ibid.*, tab. 11.5, 528. Since, if anything, agriculture increased in relative importance in the Netherlands in the eighteenth century, it is probable that if comparable data existed for the mid-seventeenth century, they would show a lower percentage in agriculture and higher percentages in the other two categories.

in England at a later date.<sup>59</sup> The role of cheap and abundant energy supply in the Dutch golden age is of particular interest.<sup>60</sup> It is noteworthy, however, that energy use in the Netherlands had already peaked before the end of the seventeenth century and thereafter declined irregularly down to the beginning of the nineteenth century.<sup>61</sup>

De Vries and van der Woude seek to demonstrate the modernity of the early modern Dutch economy, by showing that the same influences which shape the success or failure of a twentieth-century economy were dominant in the seventeenth-century Netherlands, and that the same modes of analysis which can throw light on these issues today are applicable to the Dutch economy three centuries ago. They insist that the period of stagnation which began before the end of the seventeenth century and lasted for a century-and-a-half must also be understood as modern in nature. ‘To suggest that the Republic suffered a “modern decline”’, they write, ‘must seem perverse, but this is our argument. The economy did not suffer a Malthusian crisis, nor did it revert to some preindustrial norm after a brief, “accidental” boom. In sector after sector – the economy struggled with the modern problems of profit, employment, market access, and costs.’<sup>62</sup> They then go on to make explicit the conclusions implicit in their earlier analysis: ‘This formulation harbors an implicit claim about modern economic growth. It is not self-sustained, exponential, and unbounded.’<sup>63</sup> The view that an economy having the hallmarks of modern capitalism is not *ipso facto* assured of exponential growth is persuasive, both in the form to be found in Adam Smith and in its most recent guise, as expounded by de Vries and van der Woude. Accepting it implies that because English growth continued unchecked, explaining her success entails directing attention to some features of English experience not represented in the

<sup>59</sup> *Ibid.*, 338.

<sup>60</sup> De Vries and van der Woude note that in the seventeenth century many of the export-orientated industries, including bricks, tiles and ceramics, pipes, beer, spirits, sugar, salt, soap, whale oil, and glass, ‘... shared a pronounced energy intensity, which suggest their common debt to the Republic’s uniquely low-cost energy supplies. It appears that energy use in the Republic, both household and industrial, stood far above the levels common to the rest of Europe until the end of the eighteenth century.’ *Ibid.*, 338–9. They remark that the foundation of the Republic’s ‘technological superiority was its effective utilization of energy supplies (peat, wind, and water), which took expression in the development of specific applications of the available energy sources to the needs of the economy’, and note that ‘The Republic’s peat deposits provided a uniquely large supply of heat energy – in excess even of England’s coal output until well into the eighteenth century.’ *Ibid.*, 344, 694. See also J.W. De Zeeuw, ‘Peat and the Dutch Golden Age: the Historical Meaning of Energy Attainability’, *A.A.G. Bijdragen* (1978), *xxi*, 3–31.

<sup>61</sup> De Vries and van der Woude, *First Modern Economy*, 710.

<sup>62</sup> *Ibid.*, 711.

<sup>63</sup> *Ibid.*, 720.

history of the Dutch Republic. This issue is the focus of the balance of this article.

I start with a platitude. The answer to any question is heavily conditioned by the way in which it is posed. I propose to discuss the divergence of England by treating the secular trend in real income per head as the most important single measure of economic growth. If this definition is adopted, there is a clear and vitally important distinction between the period since the industrial revolution and any earlier period in capitalist societies. Even though the early decades of the industrial revolution brought terrible hardship and uncertainty for many people, thereafter, and as a result of its occurrence, a larger and larger fraction of the population of the world has enjoyed a degree of freedom from material deprivation, from malnourishment, and from disease which has no earlier precedent. Pre-industrial capitalism, for reasons which have never been more clearly expressed than in the *Wealth of Nations*, was capable of leading to a more effective deployment of capital and labour than alternative systems, and, since it facilitated the division of labour, it could give rise to substantial improvements in output per man hour. Yet, again for reasons which were spelled out by Adam Smith, this did not imply that progress in this regard would be prolonged, or universal. Rather, with the exhaustion of opportunities for the profitable employment of capital, it was likely that the stationary state would supervene and that 'corn wages', that is the purchasing power of the average worker, would be driven down to a low level. This is a realistic assessment of the possibilities open to an organic economy, but not to an economy which has ceased to be organic.

It was in early modern England that a new base for economic activity began to appear for the first time on a substantial scale, emerging initially so inconspicuously that the classical economists mistook England still for what all societies had been previously, a country constrained by the limitations from which an organic economy cannot free itself. Adam Smith accounted for the initial divergence of England, indicating how she achieved a striking degree of success in making the most of the possibilities of an organic economy, though in this England had been anticipated by Holland. English agriculture succeeded not only in raising food output to keep pace with population increase at rates much higher than those found on the continent; output of animal and vegetable raw materials to sustain a rapid growth of industry; and output of energy in the form of fodder for a rising population of draught animals to bolster both agriculture and transport, but achieved this with little or no increase in the agricultural labour force. Thus for several centuries there was a benign conjunction of rising aggregate output and rising output per head in agriculture which both permitted and fostered a great expansion in the demand for the products of

secondary industry and for the services supplied by the tertiary sector, paralleled by major changes in the occupational structure of the labour force. The same developments also underpinned a notable surge in urban growth.

These changes would have sufficed to bring about a major reordering of England's rank within the nations of Europe, economically, politically, and militarily, as indeed they had already done in the case of the Dutch Republic. They would not, however, have sufficed on their own to engender an industrial revolution. England was not simply successful in making the most of the possibilities of an organic economy; the first beginnings of a more radical change were in train. No matter how assiduously Icarus may strive, human flight is not possible if the energy employed in the attempt is muscular. Yet what will always elude the flapping of artificial wings is readily achieved with the assistance of mechanical power. An organic economy suffers from certain necessary limitations which are, as Ricardo asserted, ultimately related to physical constraints. An economy which is increasingly based on inorganic raw materials is not so constrained. Its advantages spring partly from the fact that harnessing the stored energy of innumerable past millennia of insolation in the form of coal, oil, and natural gas places at the disposal of mankind vastly greater quantities of energy than can be secured when the annual quantum of energy is limited by the process of photosynthesis. But the change confers the further advantage that the input of raw materials into the production process, which in an organic economy always creates competition for the use of land, can be achieved from the mouth of a mine rather than from a cultivated field.

Between Elizabethan and Victorian times England moved gradually from dependence upon a purely organic base to a mixed economy in which a steadily increasing fraction of the output of secondary industry was based on minerals. In so doing she also eased herself clear of the problems which would otherwise have led to increasing difficulties. The significance of the change was not apparent to the classical economists. Yet the fact that in 1800 British coal output was providing as much energy as would otherwise have required the devotion of about 15 million acres to the production of wood for fuel on a sustained yield basis is a telling instance of the scale of the changes which had been taking place.<sup>64</sup> When Arthur Young travelled the length and breadth of France in the years 1787, 1788, and 1789 he frequently remarked upon the absence of glazing even from the windows of houses which were otherwise well-built. This was something which was, as he put it, an 'extraordinary spectacle for English eyes' at the time.<sup>65</sup> The fact that

<sup>64</sup> Wrigley, *Continuity, Chance and Change*, 54–5.

<sup>65</sup> 'Pass an extraordinary spectacle for English eyes, of many houses too good to be

sheet glass had become a commonplace in England reflected the availability of cheap thermal energy. Brick became the normal building material for the same reason. Similarly, once a means had been found to use the thermal energy of coal to smelt iron ore without introducing unwanted impurities in the process, the output of iron could reach a multiple of what had previously been possible, given the extravagant amount of heat needed to produce iron or steel and the limited area of forest available as a source of charcoal. A tree may store the energy acquired from the sun by photosynthesis for a century. A coal mine can tap the stored energy of the sun accumulated over millions of years. Further illustrations of the same point abound. The history of the advent of the steam engine, the blast furnace, the railway, the steamship, and of power-driven machinery of all types, for example, has been told many times and from many viewpoints. In the context of this essay the significance of these developments can be simply expressed. The move away from an exclusively organic economy was a *sine qua non* of achieving a capacity for exponential growth. As a result of the advent of energy-intensive and mineral-based sectors in the economy, for the first time in human history poverty became problematic: problematic because the *capacity* to satisfy human material needs was transformed, leaving uncertain only the question of whether the will and the institutional structure existed to banish it. These changes were largely an English phenomenon in their early stages, and the same changes which were transforming her productive potential were also reinforcing the divergence of England from other countries.

The gradual emergence of a new kind of economy in England during the period between the late sixteenth and the mid-nineteenth centuries raises many questions which remain controversial. Why, for example, should access to coal as a source of energy have led to the progressive transformation of so many sectors of industrial production in England but not in China, where coal usage was common in certain areas as early as the fourth century and may have reached a peak about the eleventh century?<sup>66</sup> But for present purposes the significance of these

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called cottages, without any glass windows.' A. Young, *Travels in France and Italy during the Years 1787, 1788 and 1789*, Everyman's Library (London and Toronto, n.d.), 22. He was referring to houses encountered en route between Limoges and Brive. He made similar remarks made about cottages near Pont-de-Rodez in the Dordogne and about 'a large village of well-built houses, without a single glass window' near St Gaudens (*ibid.*, 25, 30). Brittany provoked a rash of comparable comments when he passed through Combourg, Guingamp, and Auray (*ibid.*, 101, 103, 105, and again at Aix-en-Provence (*ibid.*, 208) and at Cuges-les-Pins near Toulon (*ibid.*, 213). In the last he complained that there was no glass in the windows of his room in the *auberge* even though he had one of the best rooms.

<sup>66</sup>P.J. Golas, *Mining in Science and Civilisation in China*, ed. J. Needham, v, pt. XIII (Cambridge, 1999), 186–201, esp. 195–6.

developments lies in the additional impetus which they gave to the divergence of England and the part which they played in ensuring that the growth process did not lose momentum in England as it had done in Holland. It is idle to speculate about what might have happened if, for example, there had not happened to be abundant coal close to the surface in England, but it would be rash to assume that in its absence an alternative base would have been found upon which the momentum of growth might have been sustained. Seventeenth-century Holland was plainly a highly successful capitalist economy, enjoying rapid growth. But the Dutch economy lost its earlier momentum in the eighteenth century. For well over a century it trod water. It did not fulfil the worst fears expressed by Adam Smith. But, on the other hand, when growth resumed it was not generated by a renewed domestic dynamism but rather as part of the process by which the whole of western Europe began to conform to the new path of economic growth first traced out by England. Indeed de Vries and van der Woude regard Dutch earlier success as having been an obstacle to the adoption of new production technology, arguing that the 'nineteenth-century industrial development of the Netherlands was not held back by its backwardness but rather by its very modernity'.<sup>67</sup>

There is an instructive irony about the industrial revolution in England. The great bulk of the advance made relative to continental countries before 1800 was due to much the same causes as had earlier allowed a much smaller country to achieve a brilliant period of commercial and economic dominance and a notable degree of naval and military success. It sprang from expertise in making the most of the possibilities of an advanced organic economy. In this period, the sources of increased economic efficiency were in the main institutional rather than technological, and institutional structures are often difficult to transfer to different political and social environments. Other countries both admired and feared the growth of English power, as they had earlier admired and feared Dutch success, without finding it easy to emulate. But when the sources from which growth derived themselves changed, when the new mineral-based and energy-intensive sector of the economy became the driving force of the economy as a whole, when the attention of the world was drawn to the steam engine, the puddling furnace, the railway, gas lighting, the mule, and the power loom, when, in other words, the sources of growth were technological rather than institutional, other countries found it far less difficult to recover lost ground. England's continental neighbours soon narrowed

<sup>67</sup>De Vries and van der Woude, *First Modern Economy*, 713. They note that the country possessed a large stock of capital but that this was invested in obsolete plant, equipment, and skills. *Ibid.*, 712.



the gap between themselves and their island rival. Before the end of the nineteenth century, it was England which was observing German industrial, technological, and educational excellence with increasing concern, rather than the reverse. The same developments which had allowed England to escape the constraints of an organic economy also made it comparatively easy for others to match and later to surpass her achievements. As a result, the divergence of England rapidly came to an end.