

# E.A. Wrigley and the Riddle of the World<sup>1</sup>

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The central riddle around which all of Wrigley's work has revolved is the same as that in my book.<sup>2</sup> As he puts it 'The common theme is the widening of the gap separating the history of western Europe from the history of other developed cultural and political entities in Asia, the Middle East or, indeed, in the European past.'<sup>3</sup> Put in other terms, this is the gap that became clear in the eighteenth and nineteenth centuries and which we often call the industrial, scientific, capitalist or other revolutions. Curiously, as Wrigley comments, the very momentousness of the change that occurred during that period makes it almost impossible to analyse - it either disappears, or else overwhelms with its complexity. 'The industrial revolution is the centrepiece of world history over recent centuries, and **a fortiori** of the country in which it began. Yet its significance, though seldom denied, is not prominently visible in general historical writing. It is almost as if the very bulk of the phenomenon had either rendered it invisible, absorbing it into the back-cloth of the stage, or had made it too formidable an object to be confronted face to face.'<sup>4</sup> It is thus essential to develop a set of methodological tools in order even to see what the questions are and where we should look for an answer.

One tool is the comparative method. Wrigley's first work was on the German coal industry and he later added the Netherlands, particularly Holland, and France, to his comparative analysis of England. He was thus able to compare different European countries over time and this gave him a sense of what was common to Europe and what was special about the first case of industrialization, namely England. Holland was particularly important because it was by the end of the seventeenth century the wealthiest and most progressive nation in Europe. It seemed to contain all the conditions necessary for the great shift to industrial civilization (**Industria** from here on). Yet it did not do so. Thus Wrigley is able to pursue what he considers to be the special features of England.<sup>5</sup>

The case of Holland is also essential in the development of one of Wrigley's fundamental distinctions, namely between 'modernization' and 'industrialization'. In an implicit critique of modernization theorists such as W.W.Rostow, he writes that 'All one-piece theories of modernization/industrialization, such as the analogy with the takeoff of an airplane, bear too heavily the marks of **ex post facto** summary to do justice to the Industrial Revolution.'<sup>6</sup> Looking at the Netherlands he could see that, for instance, 'The Veluwe was part of an economy which had been modernized but not industrialized. Such an economy does not necessarily mean steadily rising real incomes, nor does it imply a move towards industrialization. When rationality prevails and men's actions are informed by self-interest, there must be gains in efficiency, but there is no certain and permanent rise in living standards for the bulk of the population.'<sup>7</sup>

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<sup>1</sup> This is a preliminary assessment of the work of E.A. Wrigley, written in Japan in October 1997. Not all of the quotations have been checked.

<sup>2</sup> Alan Macfarlane, *The Riddle of the Modern World* (2000).

<sup>3</sup> Wrigley, *People*, 1

<sup>4</sup> Wrigley, *Continuity*, 7

<sup>5</sup> cf. Wrigley, *People*, 12

<sup>6</sup> Wrigley, *Modernization*, 259

<sup>7</sup> Wrigley, *Modernization*, 251

The English case looks much more accidental and contingent if we separate modernization and industrialization. He writes that '... the relationship between modernization and industrialization ... seems to me to be both widespread and unfortunate when applied to the Industrial Revolution in England. In particular, I shall argue that the connection between the two is contingent rather than necessary.'<sup>8</sup> Thus, in relation to England, he argues that 'although modernization may be a necessary condition for industrial revolution, it is not a necessary condition.'<sup>9</sup> Rather than there being an automatic link between, say, the growth of literacy, rationality, the market economy, financial institutions and a high level of commercial capitalism and industrialization, that this should lead on to a industrial revolution is far from inevitable. 'There are good reasons ... for thinking that the connection between modernization and industrialization is contingent rather than necessary, and also for supposing that in the early stages of industrialization its progress tended in many respects to impede rather than to expedite modernization.'<sup>10</sup> Thus 'we know that modernization may be followed by industrialization, but not that it must, or even that such a sequence of events is likely.'<sup>11</sup>

Once we separate modernization and industrialization, a distinction which is also vital for the understanding of it was possible for Tokugawa Japan to be a very 'modern' economy, highly monetized, highly literate, with the largest cities in the world, and yet with few signs of industrialization, we can then begin to concentrate on what extra ingredients are needed to turn a 'modern' economy into an industrial one. If we look at the problem in this way '...then the connection between modernization and industrialization appears much more a matter of happy coincidence than of ineluctable necessity. It is not what was common to all modernizing countries, but what was peculiar to England which then appears important. And what is explained is not simply why the Industrial Revolution occurred in England earlier than elsewhere, but why it occurred at all.'<sup>12</sup> Thus Wrigley re-instates the problem - **why it occurred at all**. He rightly avoids the danger of teleology, regarding it as a 'very large additional step to regard the industrial revolution as a further natural stage in the progressive development of the phenomenon.'<sup>13</sup>

Wrigley's recovery of the element of chance and contingency, of the 'miraculous' nature of industrialization was not only inspired by a knowledge of what did **not** happen in Holland and France, but also by his deep attention to the views of those who lived through the process, in particular the classical economists, Adam Smith, Malthus and Ricardo. He brings these two influences together when he writes that 'Until almost the **middle of the nineteenth century** it was still reasonable to fear a fate for England similar to that which had overtaken Holland. Hence the prominence of the stationery state in the prognostications of the classical economists.'<sup>14</sup> He points out that to us, after the event, what happened seems to be 'natural', inevitable, a logical progress. Yet to those who lived through the changes it was unforeseen and indeed highly unlikely, if not impossible. 'In retrospect, it seems tempting to regard changes of the type just described as "natural". To contemporaries like Adam Smith, Malthus or Ricardo this was not the case.'<sup>15</sup>

Much of the power of Wrigley's analysis comes out of a comparison between the predictions of those who thought most deeply about the future of agrarian society, and what actually happened. We have their model of what should happen, according to the laws or logic of the agrarian world. What has in fact happened would have astonished them - they would have called it a miracle. This provides us with vital clues. 'Prospect in 1800 and retrospect in the 1980s are so different that it is

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<sup>8</sup>Wrigley, *Modernization*, 225

<sup>9</sup>Wrigley, *Modernization*, 237

<sup>10</sup>Wrigley, *Reflections*, 81

<sup>11</sup>Wrigley, *Modernization*, 244

<sup>12</sup>Wrigley, *Modernization*, 247

<sup>13</sup>Wrigley, *Continuity*, 104

<sup>14</sup>Wrigley, *Continuity*, 116

<sup>15</sup>Wrigley, *People*, 37

tempting either to disregard the views of the classical economists on these matters and concentrate on other aspects of their writings, or to regard them as singularly wrong-headed in their assessments. To do so would be mistaken. The very fact that expectation and the event differed so markedly is itself an important clue to the nature of the changes which constituted the industrial revolution.<sup>16</sup> Let us look a little more closely at Wrigley's use of the classical economists, and in particular Adam Smith, as a kind of back-cloth or expected tendency, against which what has actually happened can suddenly be seen clearly in all its oddity and deviation from expectations.

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The classical economists analysed the laws governing the western world as it had existed since the Greeks, and all that they could learn about Asia. On the basis of this, they came up with a picture of periodic growth in the past, but pessimism about the possibility of sustained growth in the future. 'Several of the great civilizations of the preceding millennia had established complex and productive economies for a time, but all promising surges of growth had been followed by relapses and it was not unreasonable to see in the cycles of growth and decay exemplification of Ricardo's law of diminishing returns or of the cyclical pattern of growth and decline that Malthus's analysis of the working of the economic-demographic system had led him to expect.'<sup>17</sup> Thus they felt that while there 'had been room for very substantial growth in the economies of European states in the seventeenth and eighteenth centuries...the analytical principles which served best to elucidate how such growth had taken place and might be further encouraged also provided convincing reasons to conclude that it must have limits falling well short of what later generations were to learn to call an industrial revolution.'<sup>18</sup> The logical premises of such pessimism are famous - the law of population first enunciated by Smith and expanded by Malthus, namely that population will in the end grow faster than resources, and the law of diminishing marginal returns, first outlined by Malthus and expanded by Ricardo, namely that after an initial large bonus, any new technique or resource will provide diminishing returns.

Thus there was a tendency towards stasis. 'Constraints abounded and since they were rooted in basic physical and chemical processes rather than in social or political circumstances, it might seem to have been beyond the power of human society to overcome them.'<sup>19</sup> The basic constraint was that the ultimate source of all wealth, which was the land, or more elaborately, the conversion of the sun's energy through the photosynthesis of that energy by crops and animals, was limited. As Wrigley puts it 'Their pessimism about long-term economic prospects, their views on real wage trends, their insistence on the strictness of the limits to growth should be understood to be closely linked to their implicit belief that the only major sources of energy in the production process were all animate. In such a world the supposition that the productivity of the soil sets limits to the entire productive process is no more than common sense.'<sup>20</sup>

Such limits did not just affect agriculture. As John Stuart Mill, still sharing their pessimism in the 1850s, explained, the limitations applied to manufacturing as well. 'The materials of manufacture being all drawn from the land, and many of them from agriculture, which supplied in particular the entire material of clothing: the general law of production from the land, the law of diminishing return, must in the last resort be applicable to manufacturing as well as to agricultural history.'<sup>21</sup> Thus none of these great thinkers could see how societies could move into continuous and progressive growth over long periods. The 'progressive' state was exceptional; stasis or even decline was the norm. This

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<sup>16</sup>Wrigley, *People*, 35

<sup>17</sup>Wrigley, *Classical*, 10

<sup>18</sup>Wrigley, *People*, 44

<sup>19</sup>Wrigley, *Energy*, 12

<sup>20</sup>Wrigley, *People*, 37

<sup>21</sup>Wrigley, *Continuity*, 24

was clear to Smith and 'Neither Malthus nor Ricardo, perhaps the two most powerful and original minds among the classical economists other than Adam Smith, showed any inkling of the onset of a period of revolutionary progress in society's ability to generate wealth and hence to benefit the living standards of the mass of the population.'<sup>22</sup>

The importance of their analysis for us is that it shocks us into realizing how what has happened went against the tendencies of agrarian civilization; it was unprecedented, unexpected and extraordinary. 'The value of pondering on the writings of the classical economists lies in the way it reminds us that what appears to us as a gathering momentum of growth seemed to some of the ablest of contemporaries a prelude to stasis.'<sup>23</sup> Furthermore it reminds us once again that, 'even when a capitalist system had been established and the political and legal institutions and the attitudinal characteristics most favourable to growth were all in place, growth must still be constrained. All else being favourable, expansion could still not continue over the long term.'<sup>24</sup>

The central problem which made it impossible for continuous advance to occur, the law of diminishing marginal returns, could be phrased in other ways, namely as a negative feed-back loop, a high level equilibrium trap, or a law whereby each advance made further advances along the same lines more difficult. Wrigley reverts to these themes through the eyes of the classical economists many times. The very definition of a pre-industrial economy is 'a system in which movements of incipient expansion cannot fructify in a sustained exponential growth, but rather tend to provoke changes that will make continued growth more difficult to secure.'<sup>25</sup> There may be an irony in this, but it is the case. 'Pre-industrial economies were dominated by negative feedback. The process of growth itself made further growth progressively harder to secure. It is ironic that the reason for this should first have been formulated with clarity just when the analysis was about to become obsolescent.'<sup>26</sup>

Human beings were indeed trapped in a fixed world with built-in limits to growth, at quite a low level. 'The classical economists not only regarded growth as necessarily bounded but considered that it was the growth process itself which ensured that the inherent limitations associated with it would begin to bite.'<sup>27</sup> Thus, 'as growth progressed, the obstacles for further growth grew ever more pressing.'<sup>28</sup> This was the inevitable logic which had halted all agrarian societies in the past and would do so in the future. 'An organic economy, however advanced, was subject to negative feedback in the sense that the very process of growth set in train changes that made further growth additionally difficult because of the operations of declining marginal returns in production from the land.'<sup>29</sup> The most intelligent observers believed that mankind was trapped; there could be no escape. This was a world where even with less than one thousand million inhabitants most were on subsistence level.

Yet something was missing in their analysis and through a set of events that had never occurred before, and only occurred at first on one tiny island, England, a new form of civilization emerged that spread a system that can now keep six times that number alive, one third of them in tolerable affluence.

Thus the puzzle is two-fold. Firstly there is the question of how a society reaches the level of a Holland, France, England or Japan, that is a modernized, high-level commercial affluence. The

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<sup>22</sup>Wrigley, *People*, 22

<sup>23</sup>Wrigley, *Classical*, 16

<sup>24</sup>Wrigley, *Classical*, 10

<sup>25</sup>Wrigley and Schofield, *Population*, 463

<sup>26</sup>Wrigley, *Classical*, 4

<sup>27</sup>Wrigley, *Continuity*, 96

<sup>28</sup>Wrigley, *Continuity*, 34

<sup>29</sup>Wrigley, *Continuity*, 29

second problem is how it escapes through some mysterious door into a new form of civilization, **Industria**. The two puzzles are separate, yet linked. Two hurdles have to be crossed; a few crossed the necessary first one, originally only one crossed the second.

How then are we to approach these two problems? Wrigley's main point here is that since achieving both a high level of 'modernization' and then the break-through into **Industria** were extraordinarily difficult and unusual, we would expect an answer to consist of a set, or bundle, of dynamically changing and inter-connected factors over a long time period. What happened may look sudden, it may look inevitable and hence simple, but it was not. One reason recent theorists have not got far in understanding what happened is because the answer lies spread across many fields. Smith, Malthus and J.S. Mill were not just economists, but philosophers, historians, political scientists. 'Economic growth had some autonomous features but it was also bound up with the wider constitution of society, so that explanations of its nature that are confined to economic categories are foredoomed to remain unsatisfactory.'<sup>30</sup> The Enlightenment thinkers up to Mill could at least approach the problems in a broad interdisciplinary manner. But 'The subsequent splintering of academic disciplines has tended to make what was clear to Smith and Malthus less readily apparent to us. Here perhaps is a case where specialization of function has not enhanced the quality of the product.'<sup>31</sup>

We must look at the bundle of conditions for the emergence of **Industria**, rather like a set of chemicals which, when added in the right quantity and order, create a chemical reaction, something entirely new in the world. And we can isolate what the crucial elements were and learn something of their timing if we hold on to the comparative method, that is we undertake mental experiments such as asking what was special or different about Europe when compared to China, what was different about north-western Europe when compared to southern and eastern Europe, what was different about England and Holland when compared to France, and finally, what was special about the one place where industrialism started, namely England.

The two basic traps isolated by the classical economists were the population trap - the Malthusian trap - and the law of diminishing marginal returns or what Wrigley redefines in practice, though he does not actually call it this, the energy trap. Much of his analysis consists of detailed work to show how these two traps were broken. Let us start with population.

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Partly through the development and application of new demographic techniques, namely family reconstitution or the linking of baptisms, marriages and burials, partly through comparative work over long periods and across civilizations, Wrigley, often with the assistance of Roger Schofield, has identified two major demographic fault-lines in the world. The first is the contrast between a western European demographic regime (which he calls 'low pressure', that is with middling level crude birth and death rates in the range of twenty to thirty per thousand) and the regime which he calls 'Chinese' (after Malthus) with birth rates of about forty per thousand, and periodic 'crisis' mortality. The other non-western variety, termed 'West African' has a balance of high birth and death rates in the 40s. The European pattern depends heavily on the peculiar marriage pattern first specified by John Hajnal, namely late marriage (mid twenties) and up to one fifth of women never marrying. This west-European pattern can be observed to be present from at least the sixteenth century.

The second fault line is within Europe. Although Holland and Switzerland probably lie on the 'English' side, Wrigley's major contrast here is between England and France. France, and presumably

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<sup>30</sup>Wrigley, *Society*, 91

<sup>31</sup>Wrigley, *Society*, 91

the other large continental countries, has elements of a 'pre-demographic transition' pattern. Marriage is characteristically a little younger than that in England, mortality and fertility rates are characteristically a few points higher, the links between a mortality crisis and a surge in fertility are present. In other words, they conform to Malthus' model, though far less extreme than China. England, however, as Malthus realized when he researched and wrote his vastly expanded second edition of the **Principles of Population**, did not conform to the Malthusian model. It had controlled mortality and fertility, and the short-term nexus between a growth in economic resources and a rise in fertility had been broken. In other words, it had broken through the barrier and was demographically 'modern', despite the fact that it did not have effective contraception.

Thus Wrigley's answer to the first major trap noted by both Smith and Malthus, was that somehow the English had broken out of the Malthusian world. A notable demonstration of this was that for over a century before the 1740s, the English economy had been growing at roughly 0.5 per cent per annum while population had remained almost static. This crucial, non-Malthusian gap, added to other advantages such as a relatively healthy population with a balanced age structure, is one of the central mechanisms to explain how England by 1740 had become the wealthiest agrarian society, per head, in the world.

Thus Wrigley has shown that within the peculiar low-pressure regime of Western Europe, England was the extreme case. This, of course, leaves the question of why it had this determining peculiarity. In essence, Wrigley's answer seems to lie in an analysis of the intersection between the economy and the family or, in short-hand, in a tentative assertion that there was some difference between the 'peasant' mentality and social structure of France and the individualistic and capitalistic situation in England. I shall return to this shortly since these peculiarities are also central to understanding the escape from the second major classical trap - the law of diminishing marginal returns, or the limits to energy conversion.

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In considering a solution to the puzzle of the escape from the limitations of a pre-industrial, or as he calls it 'organic' economy, Wrigley did not follow the same procedure as before and examine the basic contrast between the west European path, based on animals, and mixed dry crops, especially wheat, and the 'Chinese' solution of rice agriculture. If he had done so, as Smith and Montesquieu had done, he would have added a further distinction to his work. But we can be grateful for what he has done within the intra-European comparisons. Confining himself largely to north-western Europe, he shows that just as England increasingly seems to have differentiated itself in its demographic structure from at least the sixteenth century, it did the same in its economy when compared with France.

Wrigley's picture of England is basically of a relatively backward, rural, island off the coast of Europe in the sixteenth century, drifting off like a bit broken off an iceberg, to become two centuries later, as it started to formally 'industrialize', the wealthiest and, with the exception of the Netherlands, the most urbanized country in Europe. His interest is thus in how there occurred the 'transformation of England from a rural, agricultural, sparsely populated, poor and relatively backward economy in the sixteenth century into the first instance of a society capable of producing in such abundance that chronic poverty ceased to be an inescapable part of the human lot.'<sup>32</sup> He believes that 'In 1600 there was little to distinguish the economy of the English economy from the structure of other countries in Europe. Two centuries later, the contrasts were remarkable and instructive.'<sup>33</sup>

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<sup>32</sup>Wrigley, *Continuity*, 130

<sup>33</sup>Wrigley, *Peoples*, 11

Yet these contrasts were not caused by the industrial revolution. Rather, the industrial revolution was the **effect** of the earlier changes, and indeed industrialization increasingly overshadowed the differences so that they have become invisible to us. He believed that 'English economic success long predated the conventional chronology of the industrial revolution and gradually set England apart from the continent, most notably in the course of the "long" eighteenth century.'<sup>34</sup> Rather than industrialism causing the difference between England and the rest, 'A stronger case could be made for the view that it was the industrial revolution which rapidly undermined the steadily widening advantage that Britain, and in particular England, had built up over the two centuries preceding the conventional dating of the industrial revolution.'<sup>35</sup> Thus in any understanding of what happened, 'it is important to begin by stressing the extent to which economic activity in England had already drifted away from the prevailing norm in continental western Europe during the seventeenth and eighteenth centuries.'<sup>36</sup>

In summary, Wrigley believes that between say 1550 and 1750, England changed from being a relatively backward country to being the most advanced economy in Europe and most attempts to measure real incomes per head suggest that England was at this time significantly in advance of any continental country.<sup>37</sup> The economy was growing at about 0.5% per annum, and it did so even in periods when population was stationary. By 1750, the average English person was wealthier than the inhabitants of any other agrarian civilization had ever been - only the Dutch had achieved the same level, but Holland was a small commercial and urban enclave, while England was a medium-sized agricultural country. How had this essential 'drifting away' occurred?

Wrigley gives several answers, but probably the most important lies in the development of English agriculture. It is well known that England's industrial revolution was made possible by a preceding 'agricultural revolution', that is to say that a peculiarly productive agriculture developed in the two centuries before the industrial revolution and fed into it. Here Wrigley largely endorses the peculiarity and impressiveness of the growth in England. As he writes, 'England's unusually successful showing in economic growth and individual prosperity from Elizabethan to Regency times, when compared with other European states, owed more to her achievements in agriculture than to any other single factor.'<sup>38</sup> What happened was comparatively unusual. 'The history of the agricultural economy of England between the sixteenth and nineteenth centuries was most unusual when compared with that of her continental neighbours.'<sup>39</sup> In England the output per man employed in agriculture probably doubled between 1550 and 1750, whereas in much of the continent, there was hardly any increase in **per capita** productivity. Now 'A rough doubling of output per arable acre, such as took place in England over the seventeenth and eighteenth centuries, is a striking achievement...'<sup>40</sup> There was also a much greater output per acre of land in use. 'Starting from a roughly similar level in the sixteenth century, the increase in output per acre appears to have been much greater in England than was normal on the continent over the two succeeding centuries.'<sup>41</sup> The consequence of this was that 'the average man on the land in 1800 was able to provide foodstuffs for about 1.5 families in addition to his own whereas his forerunner 200 earlier had been able to provide only for the needs of his own family and, at the most, half those of one other family.'<sup>42</sup>

What was really astonishing was that the increases in productivity which first allowed the English

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<sup>34</sup>Wrigley, *Society*, 91

<sup>35</sup>Wrigley, *Energy*, 16

<sup>36</sup>Wrigley, *Continuity*, 11

<sup>37</sup>Wrigley, *Classical*, 13

<sup>38</sup>Wrigley, *People*, 40

<sup>39</sup>Wrigley, *Productivity*, 333

<sup>40</sup>Wrigley, *Productivity*, 334

<sup>41</sup>Wrigley, *Productivity*, 335

<sup>42</sup>Wrigley, *Continuity*, 36

to enjoy a higher standard of living than any previous agrarian civilization, and then sustained the growing cities and the non-agricultural industrial labour force, was made possible not by extending the area of land in use (an open frontier), but rather by doubling the yields from the same unit of labour input. As Wrigley states, 'if success in raising output per unit area was remarkable, securing such increases from an agricultural labour force whose size did not greatly change was an even more remarkable achievement, and one of far greater significance in preparing the ground for the changes which have come, in retrospect, to be referred to as the industrial revolution.'<sup>43</sup> Thus he concludes that 'it seems hard to resist the conclusion that output per head had roughly doubled in the English agricultural labour force between about 1550 and about 1800, even though the natural population tripled over the period and the area of land in farm did not increase substantially, and in spite of the fact that the country remained effectively self-sufficient in food throughout.'<sup>44</sup> What is the secret of this enormous and fundamental improvement?

The conventional wisdom has tended to concentrate on such matters as new and improved crops and seeds, greater use of clover and nitrogenous plants, better tools, more use of marl and fertilizers. All of these were important, but what Wrigley suggests is a way in which all these changes were integrated and then mediated into increasing productivity of human labour. This is through the greater use of animals on the farm, and in particular through the immediate ancestor of the fossil-fuel machine, the horse. This, he suggests is the great and growing difference between England and the Continent during this period. England developed its animal power in mixed agriculture with a large pastoral section, employing horses, cattle, sheep, a meat and milk diet and animal traction and ploughing. On the continent there was, if anything, a movement towards an intensification of arable farming - carbohydrates and an intensification of human labour in farming. He quotes O'Brien and Keyder to the effect that "'This contrast between an animal-intensive agriculture in England and a far greater emphasis on arable farming in France is, however, central to the explanation of differences achieved in value added per hectare in the two countries: not only are animal products more valuable, but the density of animals per hectare of arable land was a critical determinant of the level physical yields achieved in the cultivation of grains, vegetables and other crops.'<sup>45</sup>

It is this difference in the application of animal energy that is the major determinant of the growing superiority of English agriculture. He suggests that 'the difference in the energy ratios suggested for England and France does correspond fairly closely with the apparent differences in agricultural productivity per head between the two countries, and, pending further investigation, it is reasonable to regard differences in available animal power as important in explaining the wide gap between output per head in agriculture in England and France.'<sup>46</sup> The consequence of this difference was that, aided by their animals, the average English agricultural worker produced far more than his French counterpart. 'One man working on the land in England produced enough to feed himself and his family and to sustain two other families working outside agriculture, or three families in all, whereas in France one peasant met only the needs of his own family plus half those of another, or one-and-a-half families in all.'<sup>47</sup> This is a key difference and suggests how it was possible to have an urban and industrial revolution. Thus he argues that not only does 'emphasis on pasture in English agriculture' go 'far to explaining how the English population could enjoy a better balanced and stabler food supply than was common abroad'<sup>48</sup> but more generally that 'energy input into the agricultural process', mainly in the form of animal power (though wind and water power were also important) 'is a strong candidate for the role of leading actor on the agricultural stage of early modern England.'<sup>49</sup>

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<sup>43</sup>Wrigley, *Productivity*, 335

<sup>44</sup>Wrigley, *People*, 39

<sup>45</sup>Ibid 115 in Wrigley, *Continuity*, 37 (note 115)

<sup>46</sup>Wrigley, *Productivity*, 330

<sup>47</sup>Wrigley, *Classical*, 77

<sup>48</sup>Wrigley, *Continuity*, 43

<sup>49</sup>Wrigley, *Productivity*, 337

Wrigley examines the development of animal power in some detail. He points out that 'Some draught animals were a virtual necessity in the heavy-plough areas of northern and western Europe. Without them, the primary preparation of the soil to receive seed was difficult to the point of impracticability.'<sup>50</sup> This was a characteristic of European agriculture. But as population built up before the Black Death, the demands for animal feed may have clashed with that of humans.<sup>51</sup> When we remember, for example, that 'Each working horse needs the fodder produced by about 5 acres of land to keep it in good condition over the working year',<sup>52</sup> we can see what an 'expensive' option animals are. Most societies in history have gradually phased out animals and replaced them with a combination of crops and human labour, a particularly notable case being Japan. What was extraordinary about England was that it did the opposite. Thus Wrigley writes that 'it is likely that the animal power available for each man engaged in agriculture had been rising significantly in England during the early modern period.'<sup>53</sup>

He suggests that in the eighteenth century there was perhaps a 27% rise in the amount of horsepower available.<sup>54</sup> Probably there was an even greater increase in the seventeenth century.<sup>55</sup> Thus between the sixteenth and eighteenth centuries there may have been a doubling in the amount of horsepower.

The value of animals can be seen by a few simple figures he gives. 'There is empirical evidence to suggest that one hour of labour from an ox achieves about 4 times as much as an hour of labour by a man and that a horse can achieve about 6 times as much as a man in an hour.'<sup>56</sup> Elsewhere he gives figures which suggest that one horse hour is equivalent to between 5.1 and 7.6 man hours in some forms of agriculture, and even that 'A man can produce only about a tenth as many foot-pounds of effort in an hour as a horse.'<sup>57</sup> The situation when horses and men were joined together is shown by two sets of figures. On the basis of Gregory King's figures for about 1700, the 502,000 'cart and plough' horses in England produced about 2.5 'man-hours' of horsepower per man. By 1811, the 700,000 similar horses produced about 3.5 'man-hours' of work per man. What this means is that the efficiency of each agricultural worker was enormously increased. A vast army of animal 'slaves' was at the disposal of the English. The level in France was probably only a little over half that of the English<sup>58</sup> and over much of the Continent the much less powerful ox was still widely used.

Horses continued to be the mainstay of agriculture for a long time and their value can be seen in a study of their role in America. In 1850 they produced over 50% of the energy in agriculture, and humans less than ten per cent.<sup>59</sup> Nor should we forget that they were essential far outside agriculture. As Wrigley writes, 'Draught animals were of great importance in mining, transport, building and manufacturing industry. Horse gins kept the coal mines free from water as the shafts sank deeper. Several of the key advances in textile machinery in the eighteenth century were initially designed with horse power in mind as a power source.'<sup>60</sup> Taking into account not only the increasing quantity of all types of livestock, sheep and cows and pigs as well as horses, but also their increasing quality, we may have one of the major explanations both of England's growing wealth in

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<sup>50</sup>Wrigley, *Productivity*, 332

<sup>51</sup>See Wrigley, *Productivity*, 331

<sup>52</sup>Wrigley, *Productivity*, 326

<sup>53</sup>Wrigley, *Continuity*, 40

<sup>54</sup>Wrigley, *Continuity*, 42

<sup>55</sup>Wrigley, *Productivity*, 329

<sup>56</sup>Wrigley, *Energy*, 10

<sup>57</sup>Wrigley, *Continuity*, 39

<sup>58</sup>Wrigley, *Continuity*, 4

<sup>59</sup>Wrigley, *Productivity*, 74

<sup>60</sup>Wrigley, *Continuity*, 74

the sixteenth to eighteenth centuries and its growing economic divergence for most of the Continent.

Yet a new puzzle then emerges. If it is the case that what first differentiated Europe from Asia was its reliance on animal power, and if this then again differentiated England from the Continent, how was it possible for the English to 'afford' so many animals? It was a far smaller country than Spain or France or Germany. There were just as many opportunities for pastoral agriculture in these countries, as the great sheep flocks of Spain for instance had earlier attested. How did the growing divergence occur, using animals as the bridging 'machine' between humans and industrial machines? How, in other words, could England afford the space for all its animals and why did humans not drive them out and turn the land to arable, as happened elsewhere?

This is not a problem which Wrigley faces directly. Yet we can gather pieces of an answer from his reply to another question, namely how did industrialism emerge, which leads him into a fascinating discussion of alternative energy sources. So we will approach the question of how the English could afford the resources for their plethora of animals indirectly, after discussing Wrigley's coal hypothesis.

### Coal and energy

Wrigley's greatest problem is to explain the 'break-out' from the logic of the laws of diminishing marginal returns as explained by Smith and his followers. However much agriculture was improved it was still constrained by the limits of the current flow of energy from the sun which could be converted for human use. The world up to the eighteenth century was an organic world living off the use of energy from the wind, water and sun. The kinds of improvements which Adam Smith talked about, an increased division of labour with its immense efficiency advantages, increased machines and technology, could raise societies to a level of affluence unparalleled in history - the sort of affluence of the Dutch by the second half of the seventeenth century. But they could proceed no further.

The key to the gate out of which **Agraria** escaped into **Industria** was black and made of carbons - coal. 'To escape from the constraints of the principle of diminishing returns, it is necessary to find substitutes for animal and vegetable raw materials in production processes, and substitutes, moreover, which do not suffer from the same disadvantage.'<sup>61</sup> It was necessary to tap not merely the current flow of energy, but the vast **stocks** of accumulated energy laid down by millions of years of the sun's power. Wrigley puts the contrast thus.

In past geological ages a proportion of the trees which grew to maturity were not, so to speak, lost to the energy equation through decay. Over millions of years they accumulated and were transformed in the Carboniferous coal measures. There thus came into existence a stock of energy equal to many thousands of years of the energy flow arising through photosynthesis. Whereas an individual tree on reaching maturity has in effect capitalized a hundred years of growth in its trunk and branches, a coalfield represents tens of millions of years of the same process, thus freezing the energy value of uncountable billions of trees.<sup>62</sup>

If one could add this energy to the growing efficiency of better tools and machines and the division of labour, mankind might indeed escape, for a while at least, the fate which the classical economists felt to be its perennial destiny. Putting it in another way, 'If ... it is unrealistic to suppose that the use of the muscular energy of man and beast plus the fullest exploitation of wind and water power would have sufficed to sustain exponential growth, then the fact that coal was present and accessible in amounts amply sufficient to meet demand must be a necessary condition for the growth that took

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<sup>61</sup>Wrigley, *Continuity*, 25

<sup>62</sup>Wrigley, *Energy*, 15

place.<sup>63</sup>

We now know, after the event, that this is what happened, and it happened first in England. Coal first supplemented and then largely replaced the animal slaves that had worked for man. Thus 'if one steam horse power was taken as the equivalent of twenty-one men, in 1840 French industry and commerce had at its disposal the equivalent of just over 1 million labourers in this new form.' These were, as Emile Levasseur put it, "'true slaves, the most sober, docile and tireless that could be imagined.'" By 1885-7 the number had grown to 98 million, 2.5 slaves for each inhabitant of France. Englishmen, of course, were slave owners on a much larger scale.<sup>64</sup> Thus, as Wrigley summarizes the transformation, 'it is arguable that the most significant triumph of "capitalism" was not that celebrated in Marxist or liberal historiography but that which saw energy stock substituted for energy flow as the foundation of modern economic activity.'<sup>65</sup>

Now, of course, the central place of coal and steam in the British industrial revolution is hardly a new theory. It is the stuff of all school textbook history. But what Wrigley has done is to revive it at the highest theoretical level by bringing it into relationship with the laws of classical economics. Furthermore he has shown something which tends to be overlooked, though it was also anticipated in the work of J.U.Nef on the British coal industry, namely that the use of coal was not an eighteenth century British invention, but went back to at least two centuries earlier. And furthermore that its use stretched into many spheres of life outside steam machinery.

Wrigley reminds us that just as in agriculture England began to diverge from the sixteenth century, so even half a century before the supposed 'industrial revolution', in other words the use of the steam engine for cotton manufacture, England was immensely in advance of other European countries. Thus 'by the beginning of the eighteenth century...coal production in England and Wales had reached a level of about three million tons per annum, or roughly half a ton per head of population. The production of coal both absolutely and **per caput** was already of quite a different order of magnitude in England from that obtained on the Continent; and by the end of the century production had tripled.'<sup>66</sup> Thus while continental Europe remained on the whole a wood and arable economy, England became a coal and animal economy. This may be related to the shortage of wood in England; what is not in doubt is that England was exceptional. 'Shortage of wood made England increasingly dependent on coal for domestic and industrial fuel from the late sixteenth century, and, until well into the nineteenth century, English coal production dwarfed that of continental Europe.'<sup>67</sup>

What, in fact, Wrigley argues is that rather than the steam engine being the **cause** of the use of coal on a large scale, it can be seen as the effect. He puts this in several ways. Rather than the steam engine generating machinery, it was 'on the contrary, the invention of machines that made a revolution in the form of steam-engines necessary.'<sup>68</sup> Or 'Marx's view of the introduction of the steam engine by factory industry is reminiscent of Voltaire's aphorism about God - if He had not existed, He would have had to be invented.'<sup>69</sup> Coal and machinery of various kinds came first - then the steam revolution was 'forced'.

Wrigley's other important message is that coal relieved the pressure, or had an enabling effect, right through the economy - just like animals. To start with the 'transition to a partial dependence upon inorganic **stocks** of energy rather than upon organic energy **flows** played an important role in

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<sup>63</sup>Wrigley, *Classical*, 11

<sup>64</sup>Wrigley, *Continuity*, 76

<sup>65</sup>Wrigley, *Energy*, 23

<sup>66</sup>Wrigley, *People*, 78

<sup>67</sup>Wrigley, *Modernization*, 248

<sup>68</sup>Wrigley, *Modernization*, 245

<sup>69</sup>Wrigley, *Modernization*, 245

allowing the English economy to expand without debilitating pressure on the land in the early modern period.<sup>70</sup> And it is here that it links up with animals. The increasing use of coal meant that land which elsewhere had to be kept as forest for wood, could be used in England for pasturing animals. Hence it is possible to argue that the extraordinary growth of animal power in England was only possible because of coal - the two went hand in hand, and finally coal took over from animals.

This is not an argument made explicitly by Wrigley, but it can be drawn out of his work, especially if we follow him in seeing the ways in which coal replaced wood in a huge diversity of areas. The economy benefited from coal use to this extent in that to secure the same quantity of heat for domestic cooking and heating, glass manufacture, brewing, dye vats, salt boiling, baking bricks, burning lime, distilling gin, baking bread, laundry processes, smelting and working metals, and so on through a virtually endless list of industrial processes, would otherwise have required many millions of acres to be devoted to growing timber.<sup>71</sup> Wrigley gives figures which suggest 'The average inhabitant of the town needed about 1.5lbs of wheat or other grain each day for his bread, but 10lbs or more of firewood to bake it, to brew his beer, roast his meat, boil his water, heat his living room, and to cover his industrial needs, heating a dye vat or working metal, for example.'<sup>72</sup> The needs are dramatically illustrated by current figures from the Third World. 'A recent study of the village of Ulipur in Bangladesh, one of the poorest of all countries in the world today, revealed that landless agricultural labourers, living on a minimal diet consisting chiefly of husked rice and yielding them each only about 1,600 kilocalories of food a day, if obliged to purchase both food and fuel through the market, would need to spend more than a third as much on the latter as on the former.'<sup>73</sup>

Another example of the way coal was essential in order to lift England out of **Agraria** can be seen in relation to two of the key substances of the industrial revolution - iron and glass. In relation to iron, Wrigley writes that 'All metal products were once scarce and relatively costly. Iron, for instance, has many physical properties that make it of the greatest value to man but as long as the production of 10,000 tons of iron involved the felling of 100,000 acres of woodland, it was inevitable that it was used only where a few hundred-weight or at most a few tons of iron would suffice for the task in hand.'<sup>74</sup> England could only have become an iron-based civilization if it had abundant coal. As for glass, Wrigley notes that in the eighteenth century, 'Arthur Young, for example, was struck by the fact that in the windows of a large village in the Garonne valley he was unable to see even a single pane of glass. Cheap and abundant heat is needed to produce glass on any scale, and glass must therefore remain a luxury wherever organic materials are the sole source of heat.'<sup>75</sup>

Another area where the development of coal allowed, and indeed encouraged, a significant development was in communications and shipping. Firstly, much of the development of British shipping was related to the growing coal transport. 'Nef has shown how important the growth of the coal trade was in developing more efficient methods of ship construction and working in this country. By the end of the seventeenth century about half of the total British merchant fleet by tonnage was engaged in the coal trade.'<sup>76</sup> Equally affected was inland transport. The canal system of eighteenth century England, as Wrigley shows was created by the need and profits of coal.

Thus by the seventeenth century England had moved in a different direction to the rest of the world. The Dutch, of course, had peat, but this set limits on their potential growth. 'Dr Zeeuw

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<sup>70</sup>Wrigley, *Continuity*, 55

<sup>71</sup>Wrigley, *Continuity*, 55

<sup>72</sup>Wrigley, *Commerce*, 13

<sup>73</sup>Wrigley, *Continuity*, 35

<sup>74</sup>Wrigley, *Continuity*, 80

<sup>75</sup>Wrigley, *Continuity*, 125

<sup>76</sup>Wrigley, *People*, 81

estimated that in the seventeenth century Holland was producing a little more than 1.5 million metric tons of peat a year. A ton of peat produces only the same heat as about half a ton of coal, and therefore English mines in 1700 were producing between 3 and 3.5 times the heat equivalent of Dutch peat beds.<sup>77</sup> By 1800 the difference between England and the Continent was vast. 'In 1800 the output of coal in Britain had reached about 15 million tons a year, at a time when the combined production of the whole of continental Europe probably did not exceed 3 million tons. In 1700, when British output was probably between 2.5 and 3 million tons, it has been estimated that it was five times as large as the output of the whole of the rest of the world.<sup>78</sup> This, as Wrigley says, underwrote 'much of the general economic change of the period.<sup>79</sup> This was the culmination of a long divergence. 'For several hundred years England had mined far more coal than any other country, and on a steadily expanding scale.<sup>80</sup> Yet once again, though we can see what happened, we are left with problem. This is more to the use of coal than the question of its availability.

## Coal and the industrial revolution

Put in a simplified form, Wrigley's argument is as follows. If we separate modernization from industrialization and looked at the triangle of England, Holland, France, we can see that England and Holland were both 'modern' nations by the end of the seventeenth century, and France was partly so. Yet only one of the three industrialized. What **extra**, special, factor did it have? The answer is **coal**. Wrigley then does a good job in showing how the natural or organic economy had reached its limits in Holland and England. Land is limited, there is only a certain distance one can get by using the current flow of energy through crops, wind, water, animals. The laws developed by the classical economists showed that an equilibrium was imminent.

What transformed the situation was the gradual (over 200 years before the Industrial Revolution) unlocking of the huge **capital** or stock reserves of carbon energy laid down over millions of years in the form of coal. This was already vital in distinguishing England - for instance in feeding its fuel needs for heating, smelting, pottery, glass, salt, in the sixteenth century onwards. Thus it was one of the factors which **allowed** the agricultural revolution - by freeing the constraints on grazing land - just as it **allowed** the growth of great cities, which were a stimulus to economic activity. None of this could be achieved to the same degree by peat.

Thus the extra factor was **coal** - this enabled the escape of England out of the high level traps. Without it the English fleet, English exports, English cities, would not have developed. Even by 1700 England was the most energy-rich (coal, animals, wind, water) country the world had ever known. The Nef revolution in the sixteenth century continued and by the later seventeenth century England was heading in a direction which no other country could easily follow.

This is all convincing. It is true that coal was indeed a **necessary** factor and its abundance in England was a crucial advantage. But we must be careful not to allow the obvious power of the argument to overwhelm us and lead to another form of inevitability - coal determinism. Two types of evidence suggest that other factors are involved than the mere accidental location of coalfields.

One of these is in relation to Europe. Much of Europe industrialized in the nineteenth century, as did America. This industrialization was largely achieved on the back of coal. Much of this coal was mined in the relevant centres - Germany, France, America. For instance the huge Anglo-German **Ruhr** coalfields, serviced by waterways, had been sitting there waiting in the same way as the British coalfields. The Dutch could have drawn their coal from there - though admittedly the

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<sup>77</sup>Wrigley, *Continuity*, 59

<sup>78</sup>Wrigley, *Continuity*, 54

<sup>79</sup>Wrigley, *Classical*, 14

<sup>80</sup>Wrigley, *Continuity*, 29

transportation and political costs would have been higher. Yet these coalfields were not widely utilized until well into the nineteenth century. Why had the English forged ahead with their coal use from the sixteenth century, whereas other European coalfields were little used? It seems doubtful that the usual explanation, namely the relative shortage of wood in England, is enough to explain the difference. In fact the pattern of wealth, social structure, geography and many other factors **combined** have to be taken into account. In other words coal is just one **necessary** but far from sufficient factor.

Wrigley might argue that what is needed is a unified nation state, modernity, good water communications, and coal. This is where the Japanese case becomes of interest. It had all of these things during the long Tokugawa period, but no industrial revolution. Japan had huge coal deposits. The coalfields in Fukuoka Prefecture on the Omga River in Kyushu were impressive. The coalfields were from 13 to 20 km from East to West and 50 km long. There were about 20 layers, each layer was 1 - 5 km deep. Coal mining started here in the sixteenth century, as in England, and we might have expected that this very reasonable (high energy) coal would have fuelled a Japanese industrial revolution. Instead, the use was marginal until the 1870s, when it suddenly increased. By the early C20 Japan was exporting coal to China and S.E. Asia and fuelling its own industrial revolution.

Admittedly much of the coal was - the average depth of coal in Japan is 600 metres underground. But there were places where it was nearer the surface and certainly the Japanese had the technique for deep mining - both gold and silver mines were widespread and indeed Japan produced something like one third of the world's silver by the C16. Why did the Japanese not develop their coal reserves - in other words, what extra was needed, and was present in England? One area one might look at is transportation. Although Japan had much water transport along its coasts, it could be argued that it was not as well served as England. Or again, much of the transport from mine to water was by horse transport, and horses were too expensive to keep in large numbers in Japan. Likewise the absence of horses meant that all the removal of water from the mines in Japan had to be done with human labour. These are factors, but only partially explain the non-development.

Another line might be in terms of political organization. Mining was controlled by the local **daimyo**, as with silver and gold mines, and they seem to have had little interest in developing coal. But why did they not have such an interest?

Here we come to probably the most important area - use. In England coal was increasingly used for smelting iron - but iron was not **needed** or **used** much in Japan. Coal was used for glass production - but glass was not used in Japan. Coal was used for heating water - but Japan has plenty of hot springs. It was used for heating houses, which increasingly had chimneys and solid walls in England. But the central parts of Japan where the population lived were much hotter than in England. To have heated houses, made of flimsy bamboo and paper, was dangerous, unnecessary and expensive. Thus the major uses for coal were absent in Japan. Only in one area was coal use developed - in providing fuel for converting seawater into salt. Here there was quite a considerable use - showing that it was present and could be mined if necessary.

All this suggests that coal itself is not a value neutral and context-free 'good'. It requires numerous sets of institutions and a large infrastructure and set of needs before it becomes useful. Basically, with abundant woodland and little demand, Japan would not make use of coal. If we compare the large pollution of seventeenth London with the smoke-free Tokyo of Morse's description we are in two different worlds. Thus 'modernization' and coal are not enough - a set of other factors turned the English into the first industrial nation and we have to go beyond Wrigley's analysis.

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Another consequence of the inter-related development of coal and agriculture was again something in which England developed in a peculiar direction during the early modern period - namely in the quantity and quality of its urbanization. Apart from the Netherlands, England was the only country in Europe which saw a dramatic and sustained growth in its towns and cities during the two hundred years before the industrial revolution. This would have been impossible without the high agricultural productivity which allowed the urban dwellers to be fed, enabled a large proportion of the population to live lives other than as agricultural labourers. They lived in cities where there was sufficient power for cooking, heating and craft manufacturing, which would, without coal, have soon, with a city the size of London, run out of fuel. Just to state one obvious fact. Without the Newcastle coal trade, London could not have become the largest city in Europe, and without the growth of London and other cities, England would not have developed into the first industrial nation. So it is very appropriate that Wrigley should have devoted much of his energy to an analysis of the comparative pattern of urbanization as between England and the Continent.

On the Continent, as a whole, there was little urban growth in the sixteenth to eighteenth centuries. He cites the work of De Vries which 'shows that between the end of the sixteenth century and the later decades of the eighteenth century (the phasing varying somewhat in different regions) there was little overall change in the degree of urbanization in Europe, some shrinkage in the smaller towns being offset by moderate growth in the largest towns.'<sup>81</sup> In particular he 'shows that, in general, smaller towns and cities, those with less than 40,000 inhabitants, were treading water, if not actually in marginal decline, during the seventeenth century and the first half of the eighteenth century. He associates their plight with the growth of industry in the countryside, where cheaper labour, fewer guild controls, and access to wider markets are alleged to have resulted in the spread of proto-industrialization.'<sup>82</sup> Indeed, we are told that 'Bairoch's estimates suggest no increase between 1400 and 1800.'<sup>83</sup> The Mediterranean cities began to decline, in fact, in the seventeenth century and elsewhere there was stasis. It was as if a highish level equilibrium had been reached and Europe could progress no further. The higher mortality rates in towns and the carrying capacity of agriculture were other limiting factors.

Once again England seems to have been the one large agrarian country (along with the Netherlands earlier) that broke through this barrier and which developed in a different direction. Wrigley describes how 'In Elizabethan times England was less urbanized than the average of west European countries. Georgian England, in contrast, was the most highly urbanized of all European countries, with the exception of The Netherlands.'<sup>84</sup> Or again, 'Britain was alone in experiencing a major and progressive increase in urbanisation. In England the urban percentage had been below the European average in 1600 but had become the second highest, after the Netherlands, by 1800.'<sup>85</sup>

Whereas on the Continent the growth of rural industry seems to have drained the towns of their vitality, in England 'there was **both** a rapid rise in non-agricultural employment in the countryside **and** a steadily accelerating urban growth at all size levels...'<sup>86</sup> Wrigley writes that 'Unquestionably, there was an increased level of industrial activity in the countryside: rural non-agricultural employment grew faster than that of the national population as a whole, and very much faster than that of the rural agricultural population. But urban population was growing faster still, and the growth was shared by all size categories of towns, so that urban growth and rural non-agricultural

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<sup>81</sup>Wrigley, *Society*, 80

<sup>82</sup>Wrigley, *Break*, 110

<sup>83</sup>Wrigley, *Commerce*, 11

<sup>84</sup>Wrigley, *Continuity*, 13

<sup>85</sup>Wrigley, *Commercial*, 17

<sup>86</sup>Wrigley, *Break*, 110

growth in England appear as complementary rather than in opposition.<sup>87</sup> Thus by 1800, the proportion of the English population living in towns, Wrigley calculates, was about 27 per cent, as compared to 11 per cent in France.<sup>88</sup>

This growth or urbanization, Wrigley suggests, is both an expression of increasing wealth and the development of market capitalism and also a cause of such development. He suggests in general that 'Urban growth, was the cause of changes which made possible the development of a capitalist economic system with the establishment of such features as individual freedom, security of the person and of property, and the replacement of custom by contract in the conduct of affairs.'<sup>89</sup> In his famous article on London,<sup>90</sup> he shows how the effects of the growth of that great city spread through the countryside, creating demand for cash crops and pumping out manufactured goods. His general model is taken from Adam Smith. 'Adam Smith explained very clearly how "the great commerce depended upon the mutual advantage that each side drew from the exchange. For it to occur, there must be as keen a wish on the part of the countryside to obtain manufactures and services from the town as to secure food and raw materials from the countryside on the part of town-dwellers."<sup>91</sup> The town encouraged growth in the countryside and vice versa. But the countryside could only make use of the town if it, too, became market oriented and wealthy enough to purchase town products. 'For the town to grow, one might say, the country had to become urbanised.'<sup>92</sup> Thus 'Urban growth and economic development were intimately connected and the relationship between the two was not the same as in England as on the continent. With his customary perspicacity, Adam Smith suggested the nature of the link in a market-oriented, capitalist society.'<sup>93</sup>

Such a growth of towns of all sizes, the concentration of population into areas where economies of scale were possible, where the 'friction of space' was lessened and where the division of labour and the concentration of energy and machinery was most convenient, all these are patterns which we now take for granted as a necessary part of the first industrial revolution. It is salutary to be reminded that such a process was not happening anywhere else in Europe during the sixteenth to eighteenth centuries.

### **The causes of these differences**

Wrigley has thus firmly established four major and increasing differences as between England and almost the entire Continent in the period between about 1550 and 1750. English demography was different, agriculture was more efficient, use of coal was far greater, and its cities and towns grew. We are naturally then led to ask **why** there were these differences. Here Wrigley adopts the strategy of pointing to yet other divergences and suggests, that they may be among the causal factors leading to the difference. As he writes, 'it is important to stress the degree to which what was distinctive about the English economy was linked to what was distinctive about English society.'<sup>94</sup>

One area to which he pays attention is the pattern of family life and particularly marriage. He frequently draws attention to the importance of the small and simple English household structure and the related unusual marriage system which encouraged delayed marriage. As he notes, the

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<sup>87</sup>Wrigley, *Break*, 106

<sup>88</sup>Wrigley, *Society*, 73

<sup>89</sup>Wrigley, *Commerce*, 8

<sup>90</sup>Wrigley, *London*.

<sup>91</sup>Wrigley, *Commerce*, 15

<sup>92</sup>Wrigley, *Commerce*, 18

<sup>93</sup>Wrigley, *Commerce*, 21

<sup>94</sup>Wrigley, *Society*, 90

extreme form of the west European family and marriage pattern in England, which pre-dates the events he is discussing, may be seen as one of the important contributory factors. He asks 'If it was not the industrial revolution that had produced the modern conjugal family system, might it not have been the existence of an unusual complex of marriage and co-residential patterns that helped to produce the radical economic changes of the industrial revolution period?'<sup>95</sup> The actual way in which this worked is sketched out briefly when he writes that 'The prior existence of a society composed of small conjugal families - where marriage came late, implied economic independence, involved neolocal residence and was associated with high levels of mobility - was strongly congenial to relatively high real incomes, adaptability and growth.'<sup>96</sup> Thus the peculiar demographic and economic patterns were in turn related to a peculiar family system.

In his article on London's importance as an engine of growth, Wrigley had drawn attention to the high geographical mobility of the English population, suggesting for instance that almost one quarter of the English population in the late seventeenth century could have lived in London for some period in their lives and this would have deep effects on the family system. As he proceeded with family reconstitution studies, Wrigley became increasingly aware of the high mobility. Thus he found that 'The proportion of men and women who lived out their lives in the parish of their birth was remarkably low in England. Family reconstitution studies have repeatedly shown that the percentage of children born in a given parish and surviving childhood who subsequently married and/or died there was very small.'<sup>97</sup> This was a finding confirmed by many other sources: 'There is evidence from a range of different sources to suggest that levels of mobility were high in England during this period.'<sup>98</sup> One effect of this was on the nature of the family and local community: 'the umbilical link between the individual and his family and community was cut early in life.'<sup>99</sup> The contrast is with most Continental countries where **Le Village Immobile** is a reasonable summary of the tendency for most people to be born, live and die in the same or nearby parishes.

Not only was geographical mobility unusually high, but also Wrigley occasionally alludes to something unusual in the pattern of stratification or social mobility. As he points out, the development of market capitalism depends not merely on resources, but also the freedom of individuals to engage in their use. 'Whether or not opportunities were seized depended upon the socio-political condition of society ... the strength and nature of status distinctions...'<sup>100</sup> Wrigley believes that 'the structure of English rural society was sufficiently unusual to suggest that it should receive close attention.' He believed that there is something in the 'Brenner thesis' that 'only in England did those at the base of rural society gain a complete command of their own labour while those at the top gained absolute control of their property and land.' Although this is crude, 'the extent and importance of the contrasts between England and the near continent are readily visible.'<sup>101</sup>

One way in which Wrigley tries to explore the differences lies in an opposition between the 'peasant' mentality and social structure of much of the Continent, and something different, more market-oriented and mobile, which developed in England. The two ends of the continuum are summarized thus. 'At one extreme, one might place the system of peasant agriculture in Austria described by Berkner; at the other, the kind of rural community that had become commonplace in England by the eighteenth century.'<sup>102</sup> Not only does he see a contrast, but he believes that it grew greater over time, in particular between the sixteenth and eighteenth centuries. While the Continent,

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<sup>95</sup>Wrigley, *Reflections*, 77

<sup>96</sup>Wrigley, *People*, 13

<sup>97</sup>Wrigley, *Society*, 86

<sup>98</sup>Wrigley, *Peoples*, 111

<sup>99</sup>Wrigley, *Society*, 86

<sup>100</sup>Wrigley, *Society*, 91

<sup>101</sup>Wrigley, *Society*, 82

<sup>102</sup>Wrigley, *Society*, 87

for instance France, remained 'peasant', England swung away in a different direction. 'While France may not have lain at one end of this spectrum of possibilities, nor England at the other, there can be little doubt about the relative positioning of the two. Nor can there be much doubt that between Tudor and Regency times England moved a long way across the spectrum, while any change in France was more muted. Over the same period towns grew rapidly in England, far outstripping the general growth of population, whereas in France urban growth went broadly in step with the rise of population.<sup>103</sup>

If England had developed away from a 'peasant' attitude towards land, for instance, it would help to explain a number of the phenomena Wrigley feels are important - the geographical mobility, the increasing agricultural efficiency and so on.

If, to the farmer, land is an asset like any other, valued chiefly as it affords a return on capital invested, and leasehold is regarded as offering as promising a base for enterprise as freehold, and the population is highly mobile, neither the economic nor the psychological prerequisites of a peasant culture are present. Agriculture is well placed to respond to opportunities presented by urban growth. Labour will find little difficulty in abandoning the countryside in favour of the town, or agriculture in favour of a handicraft or service employment, if higher wages or the prospect of fuller employment elsewhere suggest that there is an advantage to be had from making the move.<sup>104</sup>

He believes that by the end of the eighteenth century it is 'debatable whether "peasants" were still to be found in the English countryside.<sup>105</sup>

Wrigley clearly believes that the change from peasant to capitalist mentality and social structure occurred during the sixteenth to eighteenth centuries and may explain many of the odd patterns. He argues that

the release of labour from the agricultural sector was such a prominent and unusual feature of early-modern England, and the rise in agricultural productivity was such a crucial aspect of her economic development, that the demise of the virgater/husbandman and the rise of the capitalist farmer should be seen not only as a probable source of increased efficiency or production but as a plausible reason both for a much-increased output per head and for the avoidance of the deeper rural poverty that might otherwise have accompanied such a rapid increase in population.<sup>106</sup>

It was thus a different attitude to landholding as well as a different family system, which increasingly differentiated England and made it possible for it to develop a peculiar economy. 'Many of the attributes of most importance, notably those relating to landholding and to marriage, were deeply rooted in the peculiarities of English society and were not capable of adoption abroad by conscious policy decisions, a fact which helps to explain the length of the period during which the English economy steadily strengthened in comparison to its continental rivals.<sup>107</sup> The key to why towns grew and people accumulated wealth in England 'lies not so much in economics as in anthropology, in attitudes rather than in income. In a peasant society that was true to its stereotype local self-sufficiency would have high priority.<sup>108</sup> The absence of 'peasantry' released the market society.

Thus when Adam Smith drew up his blue-print of a modern commercial society, Wrigley believes that he provided an accurate description of the logic and institutions of the recent English situation. But what he was describing was in itself far from widespread and was, in fact, a very recent and

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<sup>103</sup>Wrigley, *Commerce*, 18

<sup>104</sup>Wrigley, *Society*, 86

<sup>105</sup>Wrigley, *Society*, 73

<sup>106</sup>Wrigley, *Society*, 83

<sup>107</sup>Wrigley, *Continuity*, 117

<sup>108</sup>Wrigley, *Commerce*, 18

peculiar development confined to England and the Netherlands. Wrigley quotes a long paragraph from Smith which is 'redolent with assumptions about the degree to which the market suffused the every day life of the whole population in a manner which may accurately reflect the state of affairs in eighteenth-century England, but which scarcely seems to fit the patterns of economic and social life found in most pre-industrial societies.'<sup>109</sup> England was indeed peculiar, not merely in its demography, agriculture, use of coal, urbanization, geographical and social mobility and family system, but in heaving become suffused with a capitalist or commercial mentality.

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Yet Wrigley has just pushed the question back even further. Does he have any suggestions to account for these social and other peculiarities which increasingly differentiated England from the Continent? One feature he notes as important is the welfare system. His summary of this idea is as follows. 'In Elizabethan England there began to develop an institutional framework for coping with life-cycle crises, later modified and extended, which greatly reduced the extent of dependence upon kin and thereby enlarged **pari passu** the opportunity for individual autonomy, for the establishment of atomistic individualism as a normal mode of behaviour, for the transaction of economic affairs in a capitalist manner. The development of the poor law and its associated institutions meant that while the family **might** continue to meet the exigencies of the life-cycle affecting its members it only **had** to provide help, care and guidance for the infant and child.'<sup>110</sup> He locates a major change in the Poor Law of 1598 which 'by providing protection for individuals and families facing old age, hardship and illness, was a further important predisposing factor encouraging economic growth and efficiency, since it freed individuals to participate in a market economy where a rationality based on immediate self-interest dominated in the manner immortalized in the **Wealth of Nations**'<sup>111</sup>. The size of what Wrigley describes as 'the welfare state writ small' was substantial. Re-working of Gregory King's figures for 1688 by Stone 'suggests that poor relief accounted for almost one-quarter of the total sum raised in local and national taxes combined.'<sup>112</sup> Wrigley does not analyse the causes which created the idiosyncrasy of a system in which the better off supported the unfortunate, nor does he probe its roots in medieval England. Yet he is surely right in seeing it as a necessary correlate of the independence and mobility of the English, that 'the development of capitalism was conditional upon the existence of an efficient and ubiquitous welfare system...'<sup>113</sup>

Wrigley also alludes briefly to the institutional underpinnings of market capitalism, in particular the legal and political framework. He believes that the degree to which Adam Smith's vision of the growing wealth created the division of labour 'depended upon the socio-political construction of the society.' Whether 'a market economy prevailed' was dependent on 'the nature of the legal system and the strength and nature of status divisions.'<sup>114</sup> He draws attention to the fact that Smith and Malthus 'sought an explanation of economic success or failure in the institutional framework in which material production took place. Arbitrary taxation, insecurity of personal property, the superiority of custom over contract or the privileges attaching to inherited status could blight the fairest prospects.'<sup>115</sup> Echoing Smith's views on the necessity for peace, easy taxes and a due administration of justice, Wrigley writes that 'A government which is unable or unwilling to enforce the law and maintain public order, or which levies large exactions arbitrarily and without due notice, will inhibit rational calculation and is incompatible with modernization.'<sup>116</sup> Once again, while

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<sup>109</sup>Wrigley, *Commerce*, 19

<sup>110</sup>Wrigley, *Society*, 85

<sup>111</sup>Wrigley, *People*, 13

<sup>112</sup>Wrigley, *Society*, 85

<sup>113</sup>Wrigley, *Continuity*, 120

<sup>114</sup>Wrigley, *Society*, 91

<sup>115</sup>Wrigley, *Society*, 91

<sup>116</sup>Wrigley, *Modernization*, 230

noticing this necessity, he does not proceed to investigate how such a government and law came into being in England, whereas it was notably absent on much of the Continent.

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It is this failure to follow up the political and related social and cultural peculiarities which leads to one of the few criticisms which we can make of his interpretation. Gellner in fact makes the criticism in an otherwise almost entirely eulogistic review of one of Wrigley's books. Gellner suggests that 'The earlier modernization in north-west Europe had something distinctive about its political and intellectual culture that perhaps makes it impossible to treat it as just another case of a commercial and production-oriented society, one which, it so happened, led on to industrialism, thanks to the availability of coal.'<sup>117</sup> In fact this is what Wrigley has admitted, though it is partly obscured by his coal thesis. Gellner also suggests that 'The suspicion may attach to Wrigley, as it does to his hero Smith, that in the last analysis, and all qualifications contained in this book notwithstanding, he takes the cultural and political idiosyncrasies of north-west Europe too much for granted.'<sup>118</sup> Again there is a half-truth in this, at least in relation to Wrigley. But in fact Wrigley does realize how idiosyncratic the situation was, not in north-west Europe, but in England and Holland. It is rather that his search for causes stops at this point. His mind rests here.

Thus in terms of the period 1550 to 1750 Wrigley's work reminds us strongly of several things. Firstly, England increasingly diverged from the pattern in other large continental countries. Secondly, this divergence was in a whole bundle or set of interconnected features. Wrigley noticed that Smith had adopted a multi-factor approach. 'He strove to show not only that economic development and city growth were intimately linked but also that there was a strong connection between the growth of towns, the decay of feudalism, the development of liberty, and the evolution of the modern state.'<sup>119</sup> Wrigley follows this strategy. England became a wealthy society not initially because of coal, but also 'because of the pattern of related institutions, conventions and assumptions that went with the existence of a distinctive set of tenurial and social structures on the land, the statutory provision of a poor law system of support for those in need, the institution of service, the frequency of migration over both short and long distances and the set of conventions that governed decisions to marry.'<sup>120</sup> Urbanization, industrialization, demographic changes, changes in family organization, all are linked.<sup>121</sup> In fact he develops the idea of a virtuous loop or wheel. 'The rise in the power of the British state in the course of the eighteenth century was largely a reflection of the exceptional success of the British economy and its unusual nature; but that success stemmed in part from the structure of British society and the functioning of the political system.'<sup>122</sup> His major shortcoming is that, concentrating on the economic, demographic, familistic and technological aspects, he is unable to analyse the social structure, political and legal institutions which he fully realizes are a key part of the answer.

This is one of the reasons why there is a curious gap in his theory. He continuously stresses that England - in its demography, agriculture, urbanization, mobility, and use of coal - increasingly diverged from the rest of Europe between 1550 and 1750. He shows some of the ways in **which** it diverged. But to the next question, which is **why** it diverged, he has no real answer. What was it about England that made it different? Here we are left puzzled.

Indeed there are indications that the way in which he sets up his picture would make it very

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<sup>117</sup> Gellner, *Society*, 133

<sup>118</sup> Gellner, *Society*, 135

<sup>119</sup> Wrigley, *Commerce*, 7

<sup>120</sup> Wrigley, *Society*, 91

<sup>121</sup> Wrigley, *People*, 13

<sup>122</sup> Wrigley, *Society*, 91

difficult for him to find an answer to this question. At first sight Wrigley takes a refreshingly long view of the phenomenon. He rightly warns against an assumption that the industrial revolution suddenly happened in the mid eighteenth century. 'The transition from an advanced organic to an energy-based mineral economy was long-drawn-out. In the sense that mineral sources of heat energy began to replace earlier alternatives as early as the later sixteenth century on an appreciable scale.'<sup>123</sup> He sees what happened in the eighteenth century as the culmination of a long drawn-out process. 'In this view, the Industrial Revolution is a dramatic culmination to a long-gathering process of change, rather as the cylinder may be changed with a head of steam quite quickly but only if the water has long been heating.'<sup>124</sup> Indeed he argues that we should sub-divide the problem. There was a first half, up to the eighteenth century, when England reached a very high-level commercial and farming economy, and then there was the industrial revolution proper. 'The transformation that gave rise to the industrial revolution is better regarded as spread over a period lasting more than two centuries, and consisting of two main component types of economic growth so markedly dissimilar in nature and with such different chronology that it is questionable whether their understanding is well served by using a single umbrella term to describe them.'<sup>125</sup> All this is useful. But behind it is a largely unexamined assumption, namely that all of Western Europe was structurally similar in say, 1550, and then England grew apart. Let us look at this further.

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While recognizing that the peculiar differences of the family and marriage system of England may stretch back into the medieval period, in other respects Wrigley tends to see the sixteenth century as a watershed. At the start of that century England was just a rather peripheral, rural, poor country, somewhat like Portugal, but without the great explorers. It was in its basic institutions much like rural France, Germany and so on. What then happened was that the rest of Europe (with the exception of Holland) did not change much - the **ancien regime** demography remained, the towns did not grow, the use of coal did not increase and so on. But for reasons unexplained England 'drifted off'. It became rich, urbanized and different.

This basic story accords well with the major paradigms in history since the time of Tawney and Trevelyan. All of Western Europe was developing together and then, as Marx had also suggested, England started off on a separate capitalist trail around the time of the Tudors and the Reformation. There is, of course, enough truth in this deep model for it to continue to have dominated European historiography for over half a century. Yet if it is true, we are left with the unanswered puzzle of **why** England should have drifted off.

It was against this paradigm that I reacted in *The Origins of English Individualism* (1978) where I went to the other extreme, suggesting that England was different as far back as at least the thirteenth century, and perhaps back to Anglo-Saxon times. If this were right it would help to solve some of Wrigley's unanswered problems, for it would show that already by 1500, though on the surface it looked rural and relatively backward, England was already **different**. The peculiarities of its property laws and social structure, which I summarized in the idea that England was an individualistic and not a peasant society would allow the phenomenal and efficient growth that Wrigley finds. It did not just start to drift off in about 1550. It had been on a separate course for centuries and already, I argued, travelers and commentators in the fourteenth and fifteenth centuries were drawing attention to what was politically, socially and in terms of per capita wealth, an unusual island. It was just that the drifting continuity for another three centuries made the gap so huge that it allowed a new form of civilization to occur.

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<sup>123</sup>Wrigley, *Continuity*, 95

<sup>124</sup>Wrigley, *Modernization*, 236

<sup>125</sup>Wrigley, *Continuity*, 11

Thus we are in a curious position. On the one hand, Wrigley has given a very powerful account of what happened at the demographic, urban and economical level in England. He has also gone a long way to showing how the 'escape' occurred against all the laws and tendencies of the agrarian system as outlined by Smith and his followers. He has solved the problem of **what** happened between 1600 and 1750. The explanation hinges on a **set** of inter-linked peculiarities in England, of which coal is only one, essential and necessary, but not determining factor. These peculiarities were themselves related to other peculiarities, political, legal, cultural and social which Wrigley alludes to but does not analyse.

Yet Wrigley is unable to explain **why** England became increasingly exceptional. Perhaps because Holland was likewise exceptional - only apparently lacking coal to follow England's course, Wrigley may have felt that although different from France and much of the Continent, England's course is not so very difficult to understand or in need of deep explanation. It is here that Gellner's comments are important. Looking from outside, what happened in England and Holland is just the extreme tip of a whole set of north-west European peculiarities.

Once we accept that western Europe as a whole contained a set of inter-linked peculiarities which fed into the English and Dutch cases, and these need to be explained but also we need to explain the negative reasons why these other countries did not develop in the English way, the problem becomes much more complex. My theories in **Individualism** are an attempt to make a start towards an explanation, but they run into further problems. They make England too different for too long and do not explain how the differences emerged. We need to search further.

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