9 The Emergence of Modern Man

We see, therefore, how the modern bourgeoisie is itself the product of a long course of development, of a series of revolutions in the modes of production and of exchange (Marx and Engels, 1848).

The Malthusian era was one of astonishing stasis, in terms of living standards and of the rate of technological change. It was thus an economy where we would expect that only one thing, land rents, would change across the ages. Wages, returns on capital, the capital stock per person, hours of work per person, skill premiums, should all have remained the same on average from the dawn of market economies to the end of the Malthusian era. This reinforces the puzzle of how the economy ever escaped the Malthusian Trap. How did stasis before 1800 transform itself into dynamism thereafter?

Static living standards have been amply shown by empirical evidence above, as has the slow aggregate rate of efficiency advance. Yet there were, despite this, profound changes in basic features of the economy within the Malthusian era. Four in particular stand out. Interest rates fell from astonishingly high rates in the earliest societies to close to low modern levels by 1800. Literacy and numeracy increased from being a rarity to being the norm. Work hours rose between the hunter gatherer era to modern levels by 1800. Finally there was a decline in interpersonal violence. As a whole these changes show societies becoming increasingly *middle class* in their orientation. Thrift, prudence, negotiation and hard work were imbuing themselves into communities that had been spendthrift, violent, impulsive and leisure loving.

A plausible source of this seeming evolution of human preferences is the survival of the richest that is evident in pre-industrial England. The arrival of institutionally stable agrarian economies with the Neolithic Agricultural Revolution of as early as 6,000-7,000 BC, gradually molded human behavior, probably mostly culturally, but also potentially genetically.[220] Evidence from animal populations shows that where a trait has previously been neutral in terms of survival, so that it exists in varying frequencies in populations, strong selective pressures can change the characteristics of the population in a few generations.[221]

The people of the settled agrarian economies who launched the Industrial Revolution around 1800, though they lived no better than their grandfathers of the Paleolithic, were systematically different in attitudes and abilities. The exact date and trigger of the Industrial Revolution may remain a mystery, but its probability was increasing over time in the environment of institutionally stable Malthusian economies. Technology, institutions and people were interacting in an elaborate dance in the long pre-industrial agrarian era of 8,000-10,000 years.

Interest Rates

One of the most profound prices in any economy, along with the land rents and the wage rates, is the *interest rate* for the use of capital. Capital, the stored up output that is used to aid current

[220]The insight into the potentially Darwinian nature of the Malthusian era owes to Galor and Moav, 2002, though the argument here employs different specifics.

[221]I owe this point to Oded Galor. Recent experiments in domesticating foxes and rats, for example, suggest that with sufficiently strong selection, powerful changes can be made in the behavior of animals within as few as 8 generations. Trut, 1999.

production, exists in all economies. Its principal form in the settled agrarian economies that preceded the Industrial Revolution was housing and land improvements. But another important element in temperate regions was the stored up fertility of the land, which constituted a bank that farmers could make deposits in and withdrawals from depending on the urgency of their needs. There was thus as much capital per unit of output in medieval Europe, India or China as there is in modern economies.

Because capital allows for production of more output when combined with labor and land, it commands a rent just like land, and that rent when we measure it as percentage return on the value of the capital we call the *interest rate*, or the *return on capital*. The real interest rate is simply the number of dollars of rent the lender of a $100 worth of capital will receive each year, net of allowances for the depreciation of the value of the capital from physical decay, or from losses of value through inflation in the case of financial capital. Such implicit interest rates can be measured in any society where land or housing is both sold and rented.

Measuring real interest rates is not easy in the modern world of relatively high and variable inflation rates, and rapidly changing asset prices. But inflation, as we saw for the case of England, is a modern problem generally absent from the Malthusian era. So typically in England the nominal return on assets, the annual payment to the owner divided by the price, provided a good measure of the real return on capital before 1800. For England we have two measures of the rate of return that stretch back with relatively few interruptions from the modern era to 1200. The first is the return on ownership of farmland, the major asset before 1800. The second is the return on *rent charges*. Rent charges were perpetual fixed nominal obligations secured by land

or houses. The ratio of the sum paid per year to the price of such a rent charge gives the interest rate for another very low risk asset, since the charge was typically much less than the rental value of the land or house.

Both these assets have the additional attraction as a measure of returns on capital for the pre-industrial era in Europe in that they were both excused from any taint of usury under Catholic Church doctrine. Since land and houses were productive assets it was not usurious to collect a return on the ownership of land or housing, and there were never even limitations on the amount of this return. Such an exemption was fortunate since all across medieval Europe the Church was the greatest owner of land and rent changes.

Figure 9.1 shows the percentage return on land and rent charges by decade in England from 1200 to 2000. Medieval England had real rates of return typically 10 percent or greater. By the eve of the Industrial Revolution rates of return had fallen to 4-5 percent.

The rates of return witnessed for Medieval England were in fact typical of Europe in this period. Table 9.1 shows the returns on land purchases and rent charges for other areas in Europe 1200-1349. There is surprisingly little variation across the different countries. The decline in interest rates witnessed in England was echoed across the rest of Europe. Rates of return by 1600 had fallen from these medieval levels in Genoa, the Netherlands, Germany and Flanders.[222]

All societies before 1400 for which we have sufficient evidence to calculate interest rates show high rates by modern standards. In ancient Greece loans secured by real estate gener

[222] Clark, 1988. Cipolla, 1993, 216-7, de Vries and van der Woude, 1997, 113-129, de Wever, 1978.

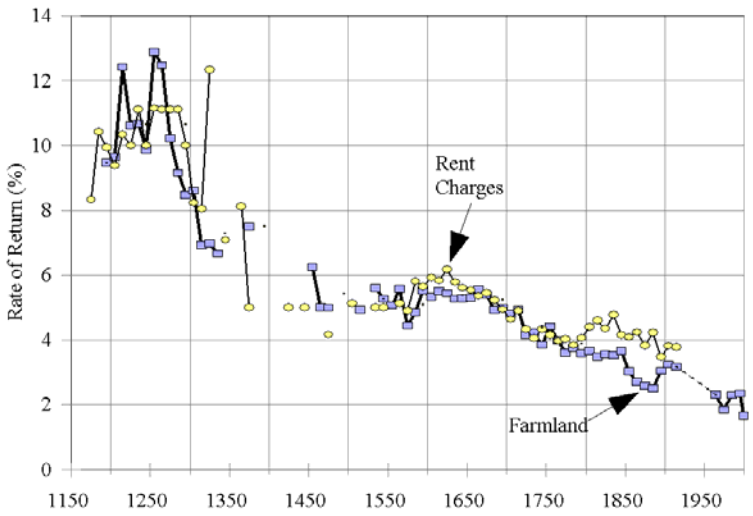

Figure 9.1 The Return on Land and on Rent Charges, 1170-2003 (by decade)[223]

Table 9.1 The Rate of Return on Capital across Europe, 1200-1349[224]

Place	Land	Rent Charges
England	10.0	9.5
Flanders	-	10.0
France	11.0	-
Germany	10.2	10.7
Italy	10.1	10.7

[223]For the years before 1350 the land returns are the moving average of 3 decades because in these early years this measure is noisy. Clark, 1988, 1998. Modern returns from farmland ownership from UK, DEFRA, prices and rents of agricultural land.

[224]Clark, 1988, table 3. Herlihy, 1967, 123, 134, 138, 153 (Pistoia, Italy).

ated returns of close to 10 percent on average all the way from the fifth century BC to the second century BC. The temple of Delos, which received a steady inflow of funds in offerings, invested them at a standard 10 percent mortgage rate throughout this period.[225] Land in Roman Egypt in the first three centuries AD produced a typical return of 9-10 percent. Loans secured by land earned typically an even higher return of 12 percent.[226]

Medieval India similarly had high interest rates. Hindu law books of the first to ninth centuries AD allow interest of 15 percent of loans secured by pledges of property, and 24-30 percent of loans with only personal security. Inscriptions recording perpetual temple endowments from the tenth century AD in South India show a typical income yield of 15 percent of the investment.[227] The return on these temple investments in South India was still at least 10 percent in 1535-1547, much higher than European interest rates by this time. At Tirupati Temple at the time of the Vijayanagar Empire the temple invested in irrigation improvements at a 10 percent return to the object of the donor. But since the temple only collected 63 percent on average of the rent of the irrigated land, the social return from these investments was as high as 16 percent.[228]

While the rates quoted above are high, those quoted for earlier agrarian economies are even higher. In Sumer, the precursor of Ancient Babylonia, between 3000 BC and 1900 BC rates of interest on silver loans were 20-25 percent. In Babylonia between

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[225]Compound interest was not charged, so since some of the loans ran for a number of years the actual rate charged was somewhat lower than 10 percent. See Larsen, 1933, 368-379.

[226]Calculated from the ratio of rents to land sale prices given in Johnson, 1933, 83-173, using wheat prices from Duncan-Jones, 1990, 146.

[227] Sharma, 1965, 59-61.

[228] Stein, 1960, 167-9.

1900 BC and 732 BC the normal rates of return on loans of silver (as opposed to grain) was 10-25 percent.[229] In the sixth century BC the average rate on a sample of loans in Babylonia was 16-20 percent, even though these loans were typically secured by houses and other property. In the Ottoman Empire in the sixteenth century debt cases brought to court revealed interest rates of 10-20 percent.[230]

When we consider forager societies the evidence on rates of return becomes much more indirect, because there is no explicit capital market, or lending may be subject to substantial default risks given the lack of fixed assets with which to secure loans. Anthropologists, however, have devised other ways to measure people's rate of time preference rates. They can, for example, look at the relative rewards of activities whose benefits occur at different times in the future: digging up wild tubers or fishing with an immediate reward, as opposed to trapping with a reward delayed by days, as opposed to clearing and planting with a reward months in the future, as opposed to animal rearing with a reward years in the future.

A recent study of Mikea forager-farmers in Madagascar found, for example, that the typical Mikea household planted less than half as much land as was needed to feed themselves. Yet the returns from shifting cultivation of maize were enormous. A typical yielded was a minimum of 74,000 kcal. per hour of work. Foraging for tubers, in comparison, yielded an average return of 1,800 kcal. per hour. Despite this the Mikea rely on foraging for a large share of their food, consequently spending most time foraging. This implies extraordinarily high time preference

[229]Homer and Sylla, 1996, 30-1.
[230]Pamuk, 2006, 7.

rates.[231] James Woodburn claimed that Hadza of Tanzania showed a similar disinterest in distant benefits, "In harvesting berries, entire branches are often cut from the trees to ease the present problems of picking without regard to future loss of yield."[232] Even the near future mattered little. The Pirahã of Brazil are even more indifferent to future benefits. A brief overview of their culture included the summary,

> *Most important in understanding Pirahã material culture is their lack of concern with the non-immediate or the abstraction of present action for future benefit, e. g. 'saving for a rainy day.' (Everett, 2005, Appendix 5).*

Why did interest rates decline?

The real rate of return, r, can be thought of as composed of three elements: a rate of pure time preference, ρ, a default risk premium, d, and a premium that reflects the growth of overall expected incomes year to year, θ_{gy}. Thus

$$r \approx \rho + d + \theta_{gy}.$$

People as economic agents display a basic set of preferences – between consumption now and future consumption, between consumption of leisure or goods – that modern economics has taken as primitives. Time preference is simply the idea that, everything else being equal, people prefer to consume now rather than later. The rate of time preference measures how strong that preference is.

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[231] Tucker, 2001, 299-338. Maize and manioc cultivation had higher yield variances, and so were riskier than foraging.

[232] Woodburn, 1980, 101.

The existence of time preference in consumption cannot be derived from consideration of rational action. Indeed it has been considered by some economists to represent a systematic deviation of human psychology from rational action, where there should be no absolute time preference. Economists have thought of time preference rates as being *hard-wired* into peoples' psyches, and as having stemmed from some very early evolutionary process.[233]

The "growth premium" in interest rates reflects the fact that if all incomes are growing it is harder to persuade people to lend money and defer consumption. Suppose everyone knows that in twenty years time their income will have doubled, which has been the case in a number of modern economies. They will all prefer to borrow from the future to enjoy better consumption now, rather than save money when they are poor to spend when they are rich. Only through interest rates rising to high levels can sufficient people be persuaded to save rather than consume now. Since sustained income growth appeared in the economy only after 1800, the income effect implies a growth in interest rates as we move from the Malthusian to the modern economy, which of course we do not observe.[234] We should be the high interest rate society, not the Malthusian era.

Default risks also cannot explain high early interest rates. The default risk premium, d, reflects the fact that all investment involves some risk that the capital invested will not result in future consumption, but will be lost. The loss could come from the

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[233] Rogers, 1994, gives an evolutionary argument for why positive time preference would exist, deducing however that the time preference rate would always be the 2.5 percent or so observed in high income modern societies.

[234] The strength of this effect depends on θ, which in turn depends on how quickly the marginal physic benefit of a unit of consumption falls with greater consumption.

death of the investor, though if they have altruism towards their children this will reduce the compensation needed for this risk. However, the risk of the death of the investor, we know from the evidence presented above on mortality in the Malthusian era, was unchanged over time, and thus cannot explain any of the decline in interest rates.

So the extra 6-8 percent return that capital offered in Medieval England, if it came from default risks, had to stem from the risk of expropriation of the asset. But in the previous chapter I have emphasized that in fact medieval England was a very stable society, and that investments in land were in practice very low risk. Confiscation or expropriation was extremely rare, and real land prices were very stable over the long run.

The medieval land market offered investors a practically guaranteed 10 percent or more real rate of return with almost no risk. It was a society where anyone could significantly change their social position just by saving and investing a modest share of their income. Suppose, for example, if a landless farm worker in thirteenth century England, at the bottom of the social ladder, were to start at age 15, invest 10 percent of their annual wage earnings in land, reinvesting any rents received. By age 50 they would have accumulated 85 acres to pass on to their children, or support them in comfort in old age, making them among the largest peasant proprietors in most medieval villages.

One other source of risk does exist in any society in purchasing land, and that is the risk that another claimant with a prior title will appear. Was it that the medieval legal system was so imperfect as to make all property purchases highly insecure?

A problem of any such interpretation is that different parts of England in the middle ages had very different jurisdictions and legal structures. Sometime before 1200, for example, London had

secured from the Crown a large set of privileges. The first of these was that the city was allowed to pay a lump sum for taxes to the King "the farm of the city", and arrange its own collection within the city of this annual sum. The town was also allowed to appoint its own judges even in cases before the crown courts so that Londoners would only ever be judged by Londoners. Land cases were to be settled according to the law of the city, even in the king's courts. Londoners were free from trial by battle, the Norman tradition that resulted in some property cases being determined by armed combat as late as the 1270s.

In the reigns of Richard I and John (1189-1216) the kings' fiscal problems led them to sell off to many other towns similar rights and privileges to those of London. Thus by 1200 or soon thereafter there were a host of local legal jurisdictions in urban areas in England under which property would be held. If the high returns on land and rent charges were the result of deficiencies in property laws and their enforcement, then we would expect some of these jurisdictions to perform much better than others. In those with the best defined property rights returns would be lowest. In the sample of rent charge returns I have for the years before 1349 I have enough data on a small group of cities and towns to compare their average rate of return with the national average. The results are shown in table 9.2. There is little difference between returns in the five specific locations and the national average rate of return. If property right insecurity explains high medieval rates of return different jurisdictions amazingly created systems with roughly the same degree of insecurity.

The third problem with an insecure property rights interpretation is that even if property rights were generally insecure in early societies, there would have been periods of greater and lesser

Table 9.2 Rent Charge Returns 1170-1349 by location (%).[235]

Location	Number of Observations	Mean Return	Median Return
ALL	535	11.0	10.1
Canterbury	30	11.8	12.2
Coventry	48	11.4	10.0
London	84	10.3	10.0
Oxford	68	10.2	10.0
Stratford-upon-Avon	8	11.7	12.3
Sudbury	8	11.1	12.3

security. Thus we would expect if the confiscation risk was the source of high early interest rates that interest rates would fluctuate from period to period, and would be connected to political developments. Yet not only were average rates of interest very-high, they tended to be high and relatively stable over time where they can be measured reasonably well as with rent charges. Thus in figure 9.1 note that the rate of return on rent charges in the decades from the 1180s to the 1290s all fall within about 1 percent of the average rate of 10.4 percent. If these returns are so high because of the radical insecurity of property why did they not show any substantial deviations between decades, despite the huge changes in political regimes in this era?

[235]In calculating the mean returns 21 observations implying rates of return below 4 percent or above 25 percent were dropped. The mean without dropping these observations for the entire sample would be 11.5 percent.

In the thirteenth century, for example, the reigns of John (1199-1216) and Henry III (1216-1272) were ones of greater turmoil in England. There was open rebellion in the last years of John's reign by the barons and again in the 1260s under Henry III. Edward I (1272-1307) ushered in nearly 40 years of stability and strong central government. But his son Edward II (1307-1327) was again a weak ruler who was eventually deposed and murdered by his wife and her lover and replaced as ruler by his son. But there is no correspondence between the periods of calm and stability, as under Edward I, and the prevailing interest rate. It is always high before 1300, whatever the high politics, but shows signs of declining in the turbulent years 1307-1327 (see figure 8.1).

The implied return on investments in land in Zele in Flanders, an area that suffered greatly from war and civil strife in the years 1580-1720, is shown in figure 9.2. These returns again show the influence of the war years with much higher returns on land purchases in the years 1581-92. But notably, despite the problems of war, the average return on land is only about 4 percent. The Netherlands and Belgium were the first areas in Europe to come close to modern rates of return in the pre-industrial era. And even in the worst years of the Spanish re-conquest in 1581-92, when many Protestants were fleeing from areas like Zele to the Dutch Republic, the average return on capital invested in land was still below the steady rate of 10 percent found even in the most secure circumstances in medieval Europe.

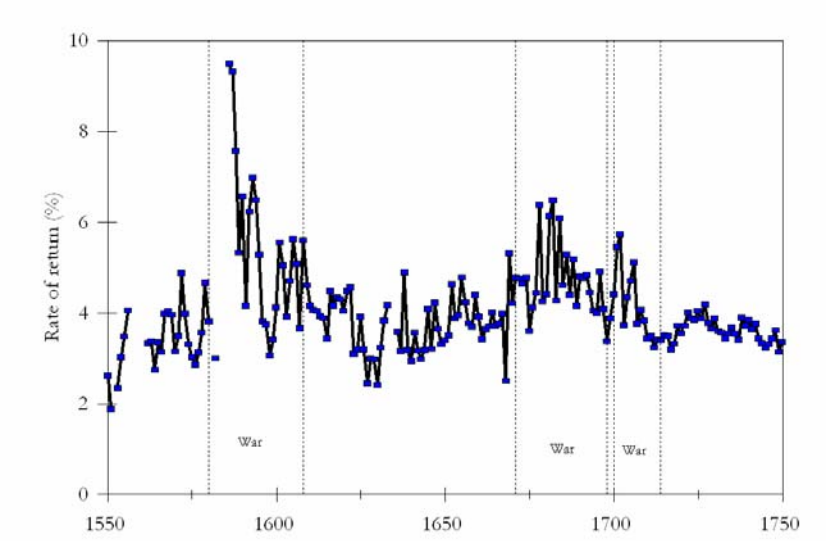

Figure 9.2 Returns on Land Holding, Zele 1550-1750[236]

Literacy and Numeracy

At the same time as we see interest rates decline, there were significant increases in the basic literacy and numeracy of societies as we approach the Industrial Revolution. We certainly find interesting evidence that the average numeracy and literacy of even rich people in the classical and medieval eras in Europe was surprisingly poor. Table 9.3, for example, shows five age declarations of a prosperous land owner, Isidorus Aurelius, in Roman Egypt in the third century A.D. No two of the declarations are consistent. Clearly Isidorus had no clear idea of his age. Within two years time he gives ages that differ by 8 years. Other sources show Isidorus was illiterate.

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[236] de Wever, 1978.

Table 9.3 Age-Reporting by Aurelius Isidorus[237]

Date	Declared Age	Implied Birth Year
April 297	35	262
April 308	37	271
August 308	40	268
pre-June 309	45	264
June 309	40	269

Isidorus's age declarations show a common pattern for those who are innumerate and illiterate. That is a tendency to round the age to one ending in a 0 or a 5. In populations where ages are recorded accurately, 20 percent of the recorded ages will end in 5or 10. We can thus construct a score variable *Z*, which measures the degree of "age heaping" where

$$Z = \frac{5}{4}(X - 20)$$

and *X* is the percentage of age declarations ending in 5 or 10, to measure the percentage of the population whose real age is unknown. This measure of the percentage of people who did not know their true age correlates moderately well in modern societies with literacy rates.

A lack of knowledge of their true age was widespread among the Roman upper classes as evidenced by age declarations made by their survivors on tombstones, which show a high degree of

[237] Duncan-Jones, 1990, 80.

age heaping, as table 9.4 shows. Typically half had ages unknown to their survivors. Age awareness did correlate with social class. More than 80 percent of office holder's ages were known to relatives. When we compare this with death records for modern Europe we find that by the eve of the Industrial Revolution age awareness in the general population had increased markedly. In the eighteenth century in Paris only 15 percent of the general population had unknown ages at the time of death, in Geneva 23 percent, and in Liege 26 percent.[238]

We can also look at the development of age awareness by looking at censuses of the living. Some of the earliest of these are for medieval Italy, including the famous Florentine *Catasto* of 1427. Even though Florence was then one of the richest cities of the world, and the center of the Renaissance, 32 percent of the city population did not know their age. In comparison a census of 1790 of the small English town of Corfe Castle, with a mere 1,239 inhabitants, most of them laborers, shows that all but 7 percent knew their age. The poor in England around 1800 had as much or more age awareness as office holders in the Roman Empire.[239] Table 8.4 shows these trends.

Another feature of the Roman tombstone age declarations is that many ages were greatly overstated. We know that life expectancy in ancient Rome was perhaps as low as 20-25 at birth. Yet the tombstones record people as dying at ages as high as 120. In

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[238] Ibid,, 90.

[239] The exception to this trend is ages recorded in the censuses of Roman Egypt, taken every 7 years. Here age heaping is modest, and the age structure is much more plausible than the tombstone ages (or ages in mummy inscriptions in Egypt). But this accuracy may be explained by the census procedures. If children first enter the census at an accurate age, and then have their ages updated by the census takers every 7 years from the previous census, accuracy will be preserved, even if the individuals themselves have little idea of their age. Bagnall and Frier, 1994.

Table 9.4 Age Heaping over time[240] *denotes ages of the dead.

Place	Date	Type	Group	Z
[a]Rome*	Empire	Urban	Rich	48
[a]Roman Africa*	Empire	Both	Rich	52
[a]Carthage*	Empire	Urban	Rich	38
[b]England	c. 1350	Both	Rich	61
[a]Florence, Italy	1427	Urban	All	32
[a]Pistoia, Italy	1427	Urban	All	42
[a]Florentine Territory	1427	Rural	All	53
[c]Corfe Castle, England	1790	Urban	All	8
[c]Corfe Castle, England	1790	Urban	Poor	14
[d]Ardleigh, England	1796	Rural	All	30
[e]Terling, England	1801	Rural	Poor	19
[f]Cotton Operatives, England	1833	Both	Workers	6

North African, 3 percent allegedly died at 100 or more.[241] Almost all these great ages must be complete fantasy. In comparison, a set of 250 relatively prosperous testators in England circa 1600 whose ages can be established from parish records, had a highest age at death of 88. Yet the children and grandchildren

[240]Since age heaping is much more evident with the elderly the table was constructed using only ages between 23 and 62. [a]Duncan-Jones, 1990, 84-90. [b]Russell, 1948, pp. 103-11, [c]Dorset Record Office, ……. [d]Essex Record Office, D/P 263/1/5. [e]Essex Record Office D/P 299/12/3. [f]Parliamentary Papers, 1834, 21-31.

[241]Hopkins, 1966, 249.

who memorialized richer Romans did not detect any implausibility in recording these fabulous ages.

On literacy the early measure we have is the ability of people to sign their name on various legal documents, shown in figure 9.3. For England these proxy measures for literacy go back to the 1580s: such things as the percentage of grooms who signed the marriage register, or the percentage of witnesses in court cases who signed their depositions. These measures similarly show a long upward movement in implied literacy rates as England approached the Industrial Revolution.

It is hard to get measures of actual literacy before 1580, but we know in medieval Europe that literacy rates must have been extremely low. In England, for example, after the Norman Conquest of 1066 clergy had the privilege of being tried in ecclesiastical courts. The test for receiving benefit of clergy became established as the ability to read a passage from the Bible. By 1351 this was established as the test in Law. In the medieval period the numbers of those outside those with clerical training who could read was so low, that the ability to read was regarded as a good enough test.

The low levels of literacy and numeracy in early societies go along with what has been called "the chronic vagueness" of early mentalities. Fabulous numbers are quoted in accounts and chronicles, even when a little enquiry would show how fallacious they were. Gervaise of Canterbury, for example, a contemporary, writing on the campaign of Henry II of England against the Count of Toulouse in 1159, notes that the king funded the war with a special tax of £180,000. English Treasury records suggest the actual sum was about £8,000. Roger of Wendover, a leading scholar of the age, notes that in 1210 there were 3,000 masters and scholars in Oxford. The actual figure would be not above 300.

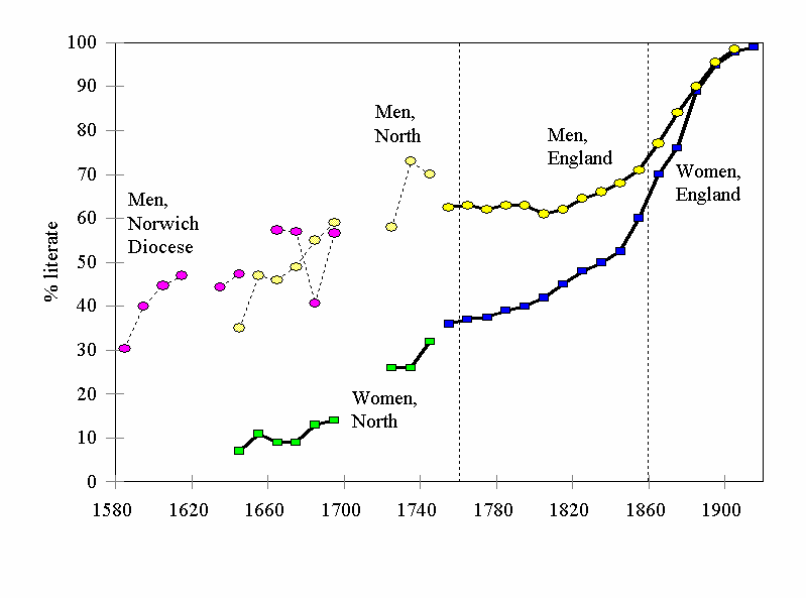

Figure 9.3 Literacy in England, 1580-1920[242]

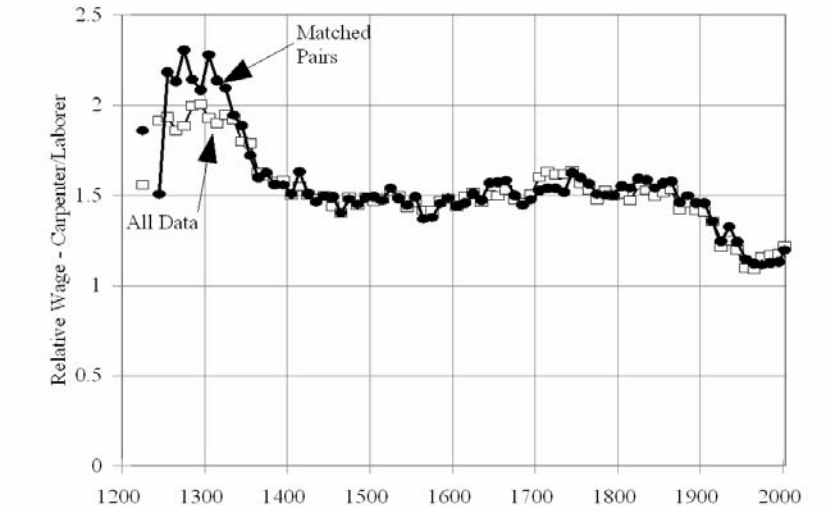

Figure 9.4 The Wage of Craftsmen relative to Laborers.

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242 1750s-1920s, Schofield, 1973, men and women who sign marriage resisters. The north, 1630s-1740s, Houston, 1982, witnesses who sign court depositions. Norwich Diocese, 1580s-1690s, Cressy, 1977, witnesses who sign ecclesiastical court declarations.

Tacitus, the great Roman historian, notes an incident at a private gladiatorial context in the small town of Fidenae, near Rome, at which a wooden stand collapsed killing 50,000 people. More recent experience with such collapses at large sporting events suggests a likelier figure would be less than 100 deaths.[243]

These rising standards of numeracy and literacy do not seem to have been driven by any market signals from inside the Malthusian economic system. There is no sign, for example, that the rewards to numeracy and literacy were any higher in 1800 in England than they were in 1200. We cannot measure this directly, but certainly the premium for other skills in the labor market seems to have actually declined over the long run. Thus if we measure the wage of building craftsmen to that of the laborers who assisted them, as in figure 9.4, we find that the skill premium was at its highest in the interval 1200-2000 in the earliest years, before the onset of the Black Death in 1349. Then a craftsman earned nearly double the wage of a laborer. If there was ever an incentive to accumulate skills it was in the early economy. Thereafter the skill premium declined to a lower but relatively stable level from about 1370 until 1900, a period of over 400 years, before declining further in the twentieth century. Thus the time of the greatest market reward for skills and training was long before the Industrial Revolution.

Nor, in places like England, was higher numeracy or literacy before 1800 the creation of any kind of government regulation or intervention. The education that people were acquiring was largely privately funded, though aided by growing numbers of charitable foundations.

Thus despite the static living conditions of the pre-industrial world we have seen that somehow a very different society had

[243]Ramsay, 1903.

emerged by 1800, at least in some parts of Europe. Returns on capital had fallen close to modern levels, work efforts were much higher in forager societies, skill premiums declined, interpersonal violence rates also declined, literacy and numeracy rose. Places like England were becoming more stereotypically middle class at all levels of the society.[244]

Judicial Violence

We have already noted the declining homicide rates in pre-industrial England, the only pre-industrial society for which we can derive such measures, in the years 1190-1800. Along with these declines in interpersonal violence went a general decline in the taste of the public for blood, torture and mayhem in pre-industrial England. Earlier societies – the Babylonians, Greeks, Romans, Incas – seem remarkably similar in many of the details of their daily life to ours, except for one thing: the apparently insatiable blood lust of the ancients. The Romans seem almost the most depraved. Criminals were executed for sport in the Coliseum and other town amphitheaters: burned, raped, gouged, mangled and mutilated before their deaths. Captives from Roman wars were made to fight to the death for the amusement of easily bored crowds. Wild animals were set on each other, or on humans, just to warm the crowd up.

Even in the medieval period England was never the scene of such viciousness as was everyday in ancient Rome. But cock

[244] Mokyr argues in an analogous way that the stock of *useful knowledge*, meaning the knowledge economic agents had about their physical environment, in Europe had been expanded greatly by 1800. The idea of performing experiments had diffused widely, for example. He ascribes this to the intellectual developments of the Age of Reason and the Enlightenment. Mokyr, 2002, 28-77. Mokyr, 2005, 286.

fighting, bear and bull baiting, public executions, and the public display of the decaying bodies of the executed were all still popular entertainments into the eighteenth century. Pepys, a man of refined musical and literary tastes, notes wryly and dispassionately in his diary

> *out to Charing Cross, to see Major- general Harrison hanged, drawn, and quartered; which was done there, he looking as cheerful as any man could do in that condition. He was presently cut down, and his head and heart shown to the people, at which there was great shouts of joy…. From thence to my Lord's, and took Captain Cuttance and Mr. Sheply to the Sun Tavern, and did give them some oysters.*[245]

What he is describing so blithely is seeing someone partially strangled, then disemboweled and castrated, then watching his organs being burned in front of him, before finally being beheaded. Gradually this delight in pain faded. The last such execution for treason in England was in 1782. Women who murdered their husbands, or counterfeited the coinage, stopped being burned at the stake after 1789.[246] Riotous behavior by visitors to view the lunatics in Bedlam, a popular entertainment in eighteenth century London, forced the Governors to hire 4 constables and 4 assistants to patrol the galleries on holidays in 1764.[247] Visits were finally restricted to those with tickets of admission from one of the Governors in 1770. The gibbeting of the bodies of executed criminals ended by 1832. Cock fighting, and bear and bull baiting were all outlawed in 1835. Finally public executions were ended in 1869.

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245 Pepys, 2000, October 13, 1660.

246 By the eighteenth century such women were normally first strangled by the executioner before being burned.

247 Hunter and Macalpine, 1963, 427-9.

Selection Pressures

Why was Malthusian society, at least in Europe, changing as described as we approached the Industrial Revolution? Social historians may invoke the Protestant Reformation of the sixteenth century, intellectual historians the Scientific Revolution of the seventeenth century, or the Enlightenment of the eighteenth. Thus

> *The Enlightenment in the West is the only intellectual movement in human history that owed its irreversibility to the ability to transform itself into economic growth (Mokyr, 2005, 336).*

But a problem with the invocations of movers from outside the economic realm is that it merely pushes the problem back one step. Like invoking God to explain the creation of the world, it necessarily invites the question of the creation of God.

Protestantism may explain rising levels of literacy in northern Europe after 1500. But why after more than 1000 years of entrenched Catholic dogma was an obscure German preacher able to effect such a profound change in the way ordinary people conceived religious belief? The Scientific Revolution may explain the subsequent Industrial Revolution. But why after at least five millennia of opportunity did systematic empirical investigation of the natural world finally emerge only in the seventeenth century?[248] And had the unexpected and inexplicable Scientific Revolution never occurred would the world have forever remained in the Malthusian trap? Ideologies may transform the economic attitudes of societies. But ideologies are themselves also

[248] Mokyr, in personal communication, argues that the Scientific Revolution and subsequent Enlightenment were themselves by products of the development of commercial capitalism in early modern Europe. But that, of course, creates another regress.

the expression of fundamental attitudes in part derived from the economic sphere.

There is, however, no need to invoke such a deus ex machina in the Malthusian era, given the strong selective processes identified in chapter 6. The forces leading to a more patient, less violent, more hard-working, more literate and more thoughtful society were inherent in the very Malthusian assumptions that under gird pre-industrial society. Figure 9.5, for example, shows literacy rates for men circa 1630 as a function of bequeathed assets. As was shown in chapter 6, the wealthiest testators who were almost all literate left twice as many children as the poorest, of whom only about 30 percent were literate. Generation by generation the sons of the literate were relatively more numerous than the sons of the illiterate.

Agrarian societies differed in two crucial ways from their forager predecessors. Agriculture allowed for much higher population densities, so that instead of living in communities of 20-50, people now lived in communities of hundreds to thousands. Already by 2,500 BC the cities of Sumeria are estimated to be as large as 40,000 people.[249] Agrarian societies also had large stocks of assets that were owned by specific people: land, houses, and animals. The sizes of these societies allowed the extensive use of money as a medium of exchange. Their size, and the importance of the income streams from these assets, created a need for enduring records of property ownership and property transfers. Thus a mass of clay tablets recording leases, sales, wills, and labor contracts survive from Ancient Sumeria and Babylonia. Figure 8.6 shows the most common type of cuneiform tablet, a receipt for delivery of goods.

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[249]Gat, 2002, --.

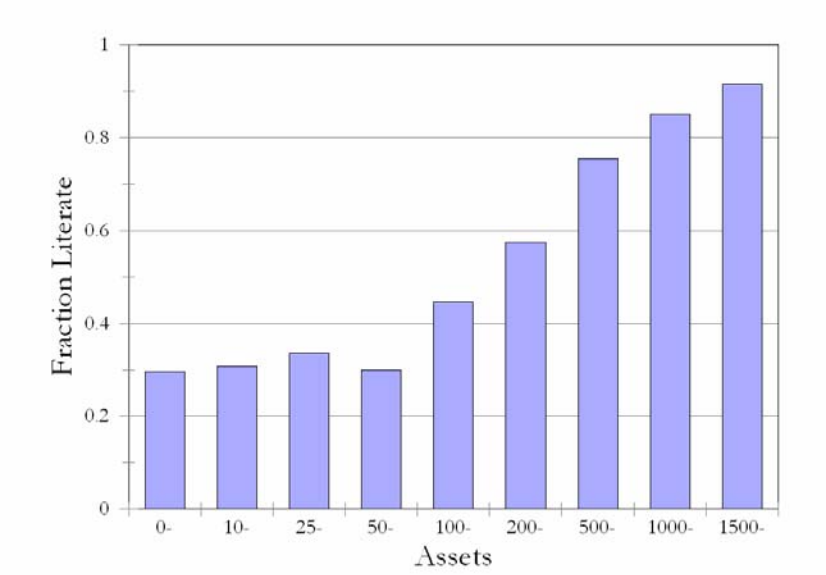

Figure 9.5 Literacy and Assets, England, male testators, 1630

In the institutional and technological context of these societies, a new set of human attributes mattered for the only currency that mattered in the Malthusian era, which was reproductive success. In this world literacy and numeracy, which were irrelevant before, were both helpful for economic success in agrarian pre-industrial economies. Thus since economic success was linked to reproductive success, facility with numbers and words was pulled along in its wake. Since patience and hard work found a new reward in a society with large amounts of capital, patience and hard work were also favored.

Figure 9.6 Receipt for delivery of cattle, Mesopotamia Ur III (2112 – 2004 BC)[250]

Trade and production in turn also helped stimulate innovations in arithmetic and writing systems designed to make calculations and recording easier. The replacement of Roman numerals by Arabic numerals in Europe, for example, was aided by the demands of trade and commerce. In medieval Europe,

> *the needs of commerce formed one important stimulus to the spread and growth of arithmetic (Murray, 1978, 191).*

In Europe religious bodies and the state, insulated from market pressures, were the slowest to adopt these innovations. The English Treasury was still employing Roman numerals in its accounts in the sixteenth century. But from the thirteenth century on Arabic numerals increasingly dominated commerce, and many

[250]Snell, 1997, figure 7.

treatises on arithmetic were clearly aimed at a commercial audience.[251]

So the market nature of settled agrarian societies stimulated intellectual life in two ways. It created a demand for better symbolic systems to handle commerce and production. And it created a supply of people who were adept at using these systems for economic ends. While living standards were not changing, the culture, and perhaps even the genes, of the people subject to these conditions were changing under the selective pressures they exerted. All Malthusian societies, as Darwin recognized, are inherently shaped by survival of the fittest. They reward certain behaviors with reproductive success, and these behaviors become the norm of the society.

What were societies like at the dawn of the settled agrarian era with the Neolithic Revolution of c. 8,000 BC? Based on observation of modern forager and shifting cultivation societies we expect that the early agriculturalists were impulsive, violent, innumerate, illiterate, and lazy. Ethnographies of such groups emphasize high rates of time preference, high levels of interpersonal violence, and low work inputs. Abstract reasoning abilities were limited.

The Pirahã, a forager group in the Brazilian Amazon, are an extreme example of this. They have only the number words "hói" (roughly one), "hoí" (roughly two), and "aibaagi" (many). On tests they could not reliably match number groups beyond 3. Once the number of objects reached as large as 9, they could almost never match them.[252] Yet the Pirahã perform very well as hunters, and in tests of spatial and other abilities. Similarly the number vocabulary of many surviving forager societies encom-

[251] Murray, 1978, 167-191.
[252] Gordon, 2004.

passes only the numbers 1, 2 and many. So forager society must thus have had no selective pressures towards the kinds of attitudes and abilities that make an Industrial Revolution.

The new world after the Neolithic Revolution offered economic success to a different kind of agent than were typical in hunter gatherer society: those with patience, who could wait to enjoy more consumption in the future. Those who liked to work long hours. And those who could perform formal calculations in a world of many types of inputs and outputs of what crop to profitably produce, how many inputs to devote to it, what land to profitably invest in. And we see in England, from at least the middle ages on, that the kind of people who succeeded in the economic system – who accumulated assets, got skills, got literacy – were increasing their representation in each generation. Thus it is plausible that through the long agrarian passage leading up to the Industrial Revolution man was becoming *biologically* more adapted to the modern economic world.

This is not in any sense to say that people in settled agrarian economies on the eve of the Industrial Revolution had become "smarter" than their counterparts in hunter gatherer society. For, as Jared Diamond points out in the introduction to *Guns, Germs and Steel*, the skills that ensure the survival and reproduction of hunter gatherers are many and complex.[253] This is illustrated by figure 9.7 which shows the earnings profile of a group of agricultural laborers with age in England around the 1830s, alongside the earnings profile of Ache hunters (measured in kilograms of meat). An English farm laborer reached peak earnings around age 20,

[253]Diamond even goes so far as to argue that selection in agrarian economies would be based on resistence to epidemic diseases that arise with more concentrated populations, so that the people of forager societies were more intelligent than those of long settled agrarian economies. Diamond, 1997, 18-22.

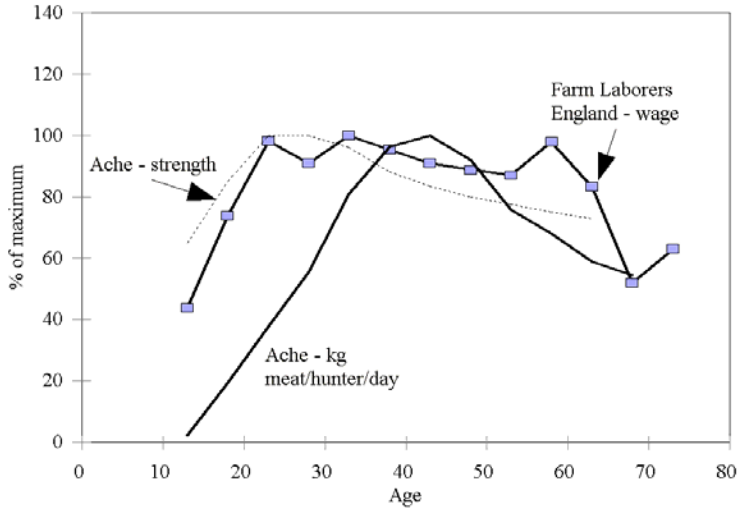

Figure 9.7 Output over the lifetime, hunter gatherer versus agrarian society[254]

while for an Ache hunter the peak did not come until the early 40s. This was despite the fact that the Ache reached a maximum of physical strength in their twenties.[255]

Clearly hunting, unlike agricultural labor, was a complex activity that took years to master. The argument is not that agrarian society was making people smarter. For the average person the division of labor agrarian society entailed made work simpler and more repetitive. The argument is instead that it rewarded with economic and hence reproductive success a certain

254 Hunting success and strength, Walker et al., 2002, 653. English farm wages, Burnette, 2006.

255 This pattern of a late peak in maximum hunting ability is common for male subsistence hunters.

repertoire of skills and dispositions that were very different from those of the pre-agrarian world: such as the ability to perform simple repetitive tasks for hour after hour, day after day. There is nothing natural or harmonic, for example, in having a disposition to work even when all the basic needs of survival have been achieved.

The strength of the selection process through survival of the richest also seems to have varied depending on the circumstances of settled agrarian societies. Thus in the frontier conditions of New France (Quebec) in the seventeenth century where land was abundant, population densities low, and wages extremely high the group that reproduced most successfully was the poorest and the most illiterate.[256] The more stable a society was, the less reproductive success could be attained by war and conquest, the more chance these mechanisms had to operate.

The claim thus is that it is no real surprise that China, despite nearly a generation of extreme forms of Communism between 1949 and 1978, emerged unchanged as a society individualist and capitalist to its core. The effects of the thousands of years of operation of a society under the selective pressures of the Malthusian regime could not be uprooted by utopian dreamers.

Below we shall consider how these selective pressures, and their differential strength across societies, might help explain the timing, location, and nature of the Industrial Revolution.

[256] Hamilton and Clark, 2006.