

UNIVERSITÀ DEGLI STUDI DI SIENA



QUADERNI DEL DIPARTIMENTO
DI ECONOMIA POLITICA E STATISTICA

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Love, War and Cultures:
an Institutional Approach to Human Evolution

n. 632 – Febbraio 2012



Abstract - Love, War and Culture have all played an important role in the evolution of human institutions and they have been characterized by complex relationships. War can select unselfish groups ready to sacrifice themselves for the love of their communities that they recognize to be culturally different from the others. At the same time, horizontal cultural differentiation cannot be taken for granted. Culture is the outcome of long evolutionary processes. It requires some human specific characteristics, including a large brain, that are likely to have been influenced by sexual selection and by the peculiar structure of human love affairs. Thus, if war may have generated love, also the reverse may be true: by favoring the development of human culture, love may have produced the conditions for war among culturally differentiated groups. In turn, war may have co-evolved with group solidarity only under the prevailing social arrangements of hunting and gathering economies. In general, human relations have been influenced by the prevailing features of the goods (private, public and positional) that have characterized production in different stages of history. They have been embedded in institutions involving very different levels of inequality, ranging from mostly egalitarian hunting and gathering societies to typically hierarchical agrarian societies and to wealth-differentiated industrial societies. The perspectives of the present-day knowledge-intensive economy can also be seen through the same institutional approach to human evolution. The different nature of contemporary production processes involves a new set of alternative possible arrangements that have different implications for social (in)equality and different capabilities to satisfy basic human needs.

Keywords: Evolution, Complementarities, Human Capabilities, Knowledge,.

JEL: B 200, N400, P510, J16, J13

I am grateful to Micheal Ghiselin and Riccardo Pansini for their useful comments

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1. Introduction.

Cultural and Institutional Diversity distinguish humans from other species. They have changed the evolutionary landscape and have involved new mechanisms of selection. Thanks to cultural evolution, the human species flourished until human-induced artificial selection became the prevailing evolutionary mechanism for many human-domesticated species. This ‘human singularity’ has been a challenging issue for evolutionary theory. It divided the co-founders of evolutionary theory: with Darwin giving a role to sexual selection and Wallace invoking some spiritual considerations that implied a partial abandonment of this theory. The human capacity to develop culture raises serious difficulties for evolutionary theory. Culture is a public good for the members of a species. It is an expensive collective software requiring an even more expensive hardware: an energy-expensive large brain that can explain why other species did not take this evolutionary path and why some selection mechanisms, such as cultural and institutional evolution, are almost entirely restricted to our species. The puzzle is explaining how and why, in our case, this evolutionary pattern has been able to succeed¹.

The following section will consider in detail the evolutionary biases in favor of positional and private benefits and the difficulty of developing public goods, including cultures and institutions, while the third section focuses on two possible explanations for the emergence of the specific traits of our species. The first explanation relies on the well-known trait of humans to live in groups and wage wars with each other. The second explanation draws on the peculiar nature of human gender relations and more in general on the complexity of their social interactions. We will argue that the two explanations can be integrated. It is plausible that war generated love by selecting those groups that were more loving and cooperative in the war effort; at the same time, love also favored, together with culture, the possibility of cultural differentiation and of ethnic conflict. The two mechanisms are not incompatible and, indeed, reinforce each other. However, we will argue that the love-causing-war mechanism can explain human singularity better. War required culture differentiation, which could only emerge after the evolution of a large brain and a rudimentary culture which, in turn, could only be developed thanks to the subsidy offered by sexual selection.

If cultural differentiation and war may have had a role in shaping the cooperative and egalitarian characteristics of the hunting and foraging societies, they also endangered their structure. If war involved only the elimination or the cultural absorption of the enemies, it could reinforce the

¹ Such a puzzle makes it impossible to erect a Berlin Wall between biology and social sciences (Hodgson, 2004).

internal solidarity of each group. However, whenever a group could enslave or dominate other groups characterized by a different culture, conflicts involved a de-stabilization of their egalitarian arrangements. This de-stabilization was likely to be rather weak in hunting and gathering societies. In these societies, the mobility of individuals and their dispersion on the territory made oppression and exploitation technologies very inefficient. However, if other technologies were available, war could easily have these effects. These technologies could be appealing to winners even when they improved their living conditions at the cost of overall productive inefficiency. In this sense, the transition to agrarian societies revealed the enormous exploitative potential of cultural diversification and war. With the first property right revolution a new institutional equilibrium came about: the hierarchical world of agrarian societies replaced the egalitarian foraging and hunting societies. The institutional equilibrium of agrarian societies, considered in the fourth section, is characterized by cumulative causation between social immobility and cultural differentiation.

Industrial societies, which are the object of the fifth section, involved a transition to societies characterized by less social immobility and less cultural differentiation. Similarly to (and more than) agrarian societies, industrial societies relied on the use of huge quantities of non-human physical capital. However, in these societies, pre-existing social positions were not always a necessary condition to acquire wealth and education. Also the opposite became true: social positions could be acquired by accumulating physical and human capital. Some social mobility becomes possible. Fixed cultural differentiations and traditional social and gender roles, which formed the basis of agrarian societies, were replaced by more homogeneous cultures. The era of the industrial revolutions was also the age of Nations and nationalism.

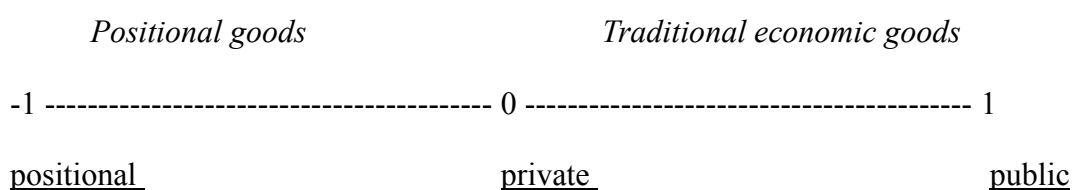
In the final section we concentrate on a third major U-turn that is perhaps happening in our own age: the advent of knowledge-intensive post-industrial societies, which, in the hopes of many egalitarians, may reconcile us with the specific characteristics of human nature, as shaped in the initial hunting and foraging phase (Bowles 2004, p. 501).

We will argue that this last phase is indeed based again, like early human societies, on the intensive use of non-rival goods but it has both the potential to decrease inequality and the unfortunate capacity to increase it to unprecedented levels. No political outcome can be taken for granted. Both great opportunities for and obstacles against egalitarian policies arise in the current stage of human history.

2. Positional goods and the nature of evolutionary processes.

The ‘selfish gene hypothesis’ relies on the observation that the provision of goods to unrelated members of the same species² improves their fitness without enhancing the fitness of the providers and tends to decrease the reproductive success of the ‘altruist’. Thus, an outcome of altruist actions is that the relative frequency of altruists declines. For this reason, because of natural selection, altruistic behavior and the provision of public goods (beneficial for the species taken as a whole) are likely to be undersupplied relatively to private goods. Moreover, evolutionary processes imply that relative frequency, or differential fitness, matters: relative positions are important to determine the long-term performance of a genotype. The envious attention to the welfare of others, which is somehow related to the thought of Veblen (1899), may therefore be grounded in the nature of evolutionary processes.

Economic theory concentrates on the interval of goods where the consumption of an individual has a zero (private goods) or positive effect (public goods) on the consumption of other individuals. Positional goods, such as status and power, are correlated to a negative consumption by other individuals. One should therefore consider, for each unit consumed by an individual, the entire interval $[-1, +1]$ defining fractions of the goods consumed by another individual. In this way the analysis can be extended to include also positional goods like power and status.



Pure private goods occupy a central location in this interval. They are characterized by the fact that other individuals consume a *zero fraction* of what a certain individual consumes. Other individuals are excluded from the consumption of these goods. By contrast, exclusion from positive fractions of consumption is impossible in the case of public goods. Indeed, in the case of a pure public good, all the agents will consume the *same positive amount* or, in other words, a fraction equal to 1 of the good.

In the case of positional goods, like status and power, when some individuals consume these goods, other individuals must be included in consumption of the related negative quantities. A pure

positional good can be defined as a good such that an agent consumes the same but negative amount of what another agent consumes.³ In this respect, pure positional goods define a case that is the polar opposite of that of pure public goods and, in a two-individuals economy, entails that the other individual consumes a fraction equal to - 1.

Consider the case of Robinson Crusoe’s island. Initially, before Friday’s arrival, Robinson will not observe any relevant difference among the goods that he consumes. He cannot perceive the distinction between private and public goods. The impossibility of exclusion, which distinguishes public goods from private goods, cannot be perceived in a situation where there are no other individuals and positional goods cannot be consumed at all if nobody else is included in their negative consumption. When Friday arrives, the distinction between public and private goods becomes evident and, according to the common prejudices of his time, the white, civilized Robinson can start to consume positive amounts of positional goods such as status and power.

Referring to the simple case of the two-individual Robinson-Friday economy the relation between the signs of these goods can be summarized as in Table 1.

Table 1. Consumption According to the Nature of Goods

	Robinson	Friday
Public good	+	+
Private good	+	0
Private good	0	+
Positional good	+	-
Positional good	-	+
Public bad	-	-

2 Following Ghiselin (1997), we define a species as an individual population capable of interbreeding.

3 This definition is given in Pagano (1999). The importance of power and status was emphasized by Veblen (1899). A different definition, based on rank, is given by Frank (1985). Frank’s definition focuses on the definition of status and is not also related to the definition of the exercise of power. On the relation between positional goods and various aspects of development see also Yotopoulos 2007, Pagano (2007c) and Romano (2007). The relation between positional goods and legal positions is examined in Pagano 2007a. For a very useful survey and assessment of the nature and significance of the concept of positional goods, see Schneider (2007).

In the case of an economy with many individuals, the classification of goods becomes more complex. In the case of positional goods, the positive consumption of an individual can be correlated with the negative consumption of one, some or all the other individuals (corresponding to the cases of bi-positional, multi-positional and pan-positional goods). Moreover, the positive amount consumed by one individual can be correlated to the negative consumption by some individuals and to the negative consumption by some other individuals. In other words, the good may be simultaneously (semi)public for some individuals and (semi)positional for other individuals. For example, expenditure on national security is a public good for the individuals of one country and a positional good for the individuals of another country.

It is not surprising that the problems of positional goods are opposite to the problems of public goods. In the case of public goods we have the standard under-investment problem in their supply (and in their abatement when they are public bads). It may prove impossible to exclude individuals from externalities with the ‘same sign’ as the good. By contrast, in the case of positional goods, we have a problem of over-investment. All the agents may try to consume positive amounts of these goods and include other individuals in the corresponding negative consumption. For this reason, ‘positional competition’ is much harder, and sometimes more violent, than competition for ‘private’ goods. It is also wasteful because individual efforts often offset each other. In some cases, individuals may end up with the same outcome that they would have achieved if they had not dedicated any effort to the improvement of their relative positions.

Evolutionary processes do not only inhibit the altruistic provision of public goods; they also, rely on positional competition and favor the oversupply of positional goods. In many cases, a ‘Red Queen’ effect seems to require each unit of selection to keep moving in order to maintain its position unchanged. In this framework, it is difficult to explain the cooperative development of public goods such as human knowledge and language. The selfish gene hypothesis seems to provide an unlikely foundation for the explanation of human cultures and the moral virtues characterizing some aspects of human behavior which, involving cooperation modes going beyond kinship altruism and reciprocal favors⁴, show complex pro-social attitudes.

⁴ A selfish gene would also provide partial advantages to the relatives of the individual where it is embodied (Hamilton 1964 and Rowthorn 2006) or also to unrelated individuals when conditions for reciprocity are satisfied (Trivers, 1971).

3. The sexual selection subsidy to the evolution of human virtues.

The notion of sexual selection is not inconsistent with that of natural selection, for it is another route to the Darwinian imperative of differential reproductive success. However, sexual selection implies that traits cannot only be the outcome of the environment exogenous to the species. A variety of solutions will stem from the internal dynamics of its sexual relations and will interact as exogenous variables with traits necessary for adaptation to the external environment.⁵

According to Gould, the indeterminacy of sexual selection was the main motivation for Wallace's distaste for a theory of evolution reliant on it. Wallace rejected the notion of sexual selection that played a fundamental role in Darwin's explanation of human intellectual and moral faculties. Paradoxically, Wallace's rigid natural selectionism⁶ is much closer than Darwin's pluralism of selection processes 'to the attitude embodied in our theory today which, ironically in this context, goes by the name of Neo-Darwinism' (Gould, 1980 p. 48). For this reason, Darwin's divergence from Wallace turns out to be useful critique of modern neo-Darwinism.

Wallace tried to explain the entire evolutionary process in terms of natural selection, but he acknowledged that natural selection failed to explain the origin of the human brain and of the human faculties. Thus, his rejection of Darwin's explanation of the emergence of the human brain in terms of sexual selection had radical consequences for the fate of the theory of evolution. In Wallace's view only some compromise with spiritualism could explain the specific human faculties and paradoxically, he concluded his (1889) assessment of Darwinism by maintaining that it was useful to demonstrate the existence of God.⁷ His lucid (but failed) attempt to explain human faculties by referring only to natural selection is particularly instructive, and it is rooted in what Gould (1980, p.49) named the 'Wallace's dilemma':

5 In spite of its obvious role, the opposition to sexual selection has been even more stubborn than the already strong resistance to the theory of natural selection. 'Evolution by orthogenesis, or even by strictly natural selection, left open the possibility of divine providence and foresight, and was not therefore not entirely unpalatable. But sexual selection allowed for nothing of the sort. Nature, in producing contraptions rather than contrivances, and acting against the interest of the species, gives rise to a spectacle of purposelessness and triviality. Darwin realized this, and much of his work on sex was explicitly directed against teleology.' (Ghiselin 1974, p. 176)

6 'Wallace who was largely ecological in his outlook, came to de-emphasize sexual selection because he was so impressed to the close adjustment of organisms to their environments. He would seem to have run into difficulties with the logic of conditional statements, and to have felt that natural selection would necessarily counteract a deleterious pleiotropic effect' (Ghiselin 2003 p. 229). However, what matters is overall fitness, which includes mating success.

7 'We thus find that the Darwinian theory, even when carried out to its extreme logical conclusion, not only does not oppose, but lends a decided support to, a belief in the spiritual nature of man. It shows us how man's body may have been developed from that of a lower animal form under the law of natural selection; but it also teaches us that we possess intellectual and moral faculties which could not have been so developed, but must have had another origin; and for this origin we can only find an adequate cause in the unseen universe of Spirit' (Wallace, 1889, p. 478).

all 'savages', from our actual ancestors to modern survivors, had brains fully capable of developing and appreciating all the finest subtleties of European art, morality and philosophy; yet, they used in the state of nature, only the tiniest fraction of that capacity in constructing their rudimentary cultures, with impoverished languages and repugnant morality.

According to Darwin, the solution of this puzzle resides in the numerous relevant consequences that sexual selection has for the traits of all living organisms.

He who admits the principle of sexual selection will be led to the remarkable conclusion that the nervous system not only regulates most of the existing functions of the body, but has indirectly influenced the progressive development of various bodily structures and of certain mental qualities. Courage, pugnacity, perseverance, strength and size of body, weapons of all kinds, musical organs, both vocal and instrumental, bright colours and ornamental appendages, have all been indirectly gained by the one sex or the other, through the exertion of choice, the influence of love and jealousy, and the appreciation of the beautiful in sound, colour or form; and these powers of the mind manifestly depend on the development of the brain. Darwin (1879 p. 687).

With specific reference to the specific human ability to learn languages, Darwin observed:

.....some early progenitor of man, probably first used his voice in producing true musical cadences, that is singing, as do some of the gibbon-apes at the present day; and we may conclude from a widely-spread analogy, that this power would have been especially exerted during the courtship of the sexes - would have expressed various emotions, such as love, jealousy, triumph - and would have served as a challenge to rivals. It is, therefore, probable that the imitation of musical cries by articulate sounds may have given rise to words expressive of various complex emotions (Darwin 1879 p. 109).

And later in the same book, Darwin (1879, p. 639) ironically observes:

The impassioned orator, bard or musician, when with his varied tones and cadences he excites

the strongest emotions in his hearers, little suspects that he uses the same means by which his half-human ancestors long ago aroused each other's ardent passions, during their courtship and rivalry.

Sexual selection can resolve Wallace's dilemma: even if different human populations have lived under extremely different environmental and social conditions, human faculties could have developed, in an early phase of their evolutionary history, under the pressure of common sexual selection rules. For instance, in an early stage, public goods like language are costly to develop and are likely to have initially adverse fitness consequences in terms of natural selection. But they can immediately favor males courting females in more articulated ways, as well as females able to engage in attractive dialogues, by which they can also better understand the qualities and shortcomings of potential partners. From this point of view, communication and language would not only have a public good aspect and some private benefits; they would also have some positional good aspects and, like a peacock's tail, they could become the objects of evolutionary over-investment.⁸ Being endowed with superior language and social skills became essential to find better and more numerous mates.

In some respects, one could view our large brain, together with our sophisticated consciousness and our complex communication skills, as our own peacock's tail. However, although both the human brain and the peacock's tail have emerged under the pressure of sexual selection, the similarity is rather misleading. It is true that, in an initial phase, a large brain, similarly to the peacock's tail is likely to have been more a liability than an asset in terms of 'natural fitness', and only a high 'sexual subsidy' was able to make it viable in terms of reproductive success. Until many complementary characteristics, such as development of language and culture, menopause and longer life (Battistini, Pagano 2008) were developed, a large brain may, like the peacock's tail, have been a disadvantage in terms of natural selection, and it may have shared the characteristics of a pure positional good, with even a negative impact on the overall welfare of the species.

However, the similarity stops here. The large brain of humans and their specific intellectual faculties may have been a disadvantage for some time; but they later gave the human species an enormous advantage.⁹ While the peacock's tail can be regarded as a pure positional good signalling

8 A 'peacock interpretation' of the development of the brain is offered by Miller (1999) and is based on Zahavi's (1975) handicap principle.

9 If in some cases, like the peacock's tail, one may substitute environment-related fitness for mating success, in other cases, like horns, there is some degree of complementarity between them. Within certain limits, in so far as they do not impair motility (i. e. the ability to move), horns also have a positive fitness in terms of natural selection (Ghiselin 1974, p.135). From this point of view, in the long run, the human brain became closer to the case of horns than to the case of the peacock's tail.

the relative fitness of the different males, the brain was an ingredient in determining our relative standings in terms of emotional and social intelligence. The relative standing in terms of emotional and social intelligence - two abilities with public good characteristics which are usually likely to be undersupplied - became crucial for reproductive success in the human species. In the fortunate case of humans, the oversupply due to positional competition balanced the undersupply that characterizes the production of public goods.

But there are other relevant differences. While the peacock's tail implied an asymmetry in sexual characteristics, the human faculties associated with the development of the brain became a characteristic shared by women and men. This is in turn related to another characteristic of brain-intensive sexual competition: it proved advantageous to both partners to develop forms of social and emotional intelligence that enable the choice of the 'best' partners, minimizing the risks of their 'ex-ante' and 'ex-post' opportunism. The development of the human brain is related to the unique nature of the human fertilization system, which is based on female concealed ovulation and female selective receptivity over an extended period¹⁰. For women, signaling sexual interest became a non-mechanical act and involved complicated brain-intensive female sexual choices.¹¹ Also males had to develop brain-intensive capabilities to gain exclusive access to female fertility resources and to construct viable reproductive partnerships. For both genders, understanding the characteristics of actual and potential partners (and rivals) became an important requisite for successful reproduction. Both were involved in a sophisticated exchange and cooperation that could be favored by romantic melodies but could only be satisfactorily worked out with the development of an articulated language by both sexes.¹² The symmetry of this development, and even the uncertainty of which gender started it, did not escape Darwin's (1871, p. 639) careful analysis:

'.....we have no means of judging whether the habit of singing was first acquired by our male

¹⁰ The argument is developed in detail in Battistini and Pagano (2008). Observe that concealed ovulation and extended female receptivity are somehow related. As Jarred Diamond (1998) points out for humans sex is fun over such an extended period because, given the concealment of fertility, this increased reproductive fitness. At the same time, ovulation is genuinely concealed only if female receptivity is extended well beyond the fertility time. In very insightful paper on Bayesian adaptation under computationally bounded rationality, Paul David (2001) observes how, in spite of a considerable collective effort, women were not able to discover the fertility period and the post-war scientific discoveries concerning this period came out as a surprise. However, our argument about the role of the human fertilization system on the evolution of the human brain does not require a complete concealment of the fertility of ovulation but simply a very weak fertility signal.

¹¹ The initiation of a young 'wild woman' must start with her learning how to distinguish between attractive, but dangerous, 'Bluebeards' and genuinely reliable partners (Pinkola Estes 1992, chap.2). Much emotional intuition and intelligence is already required by this very basic skill.

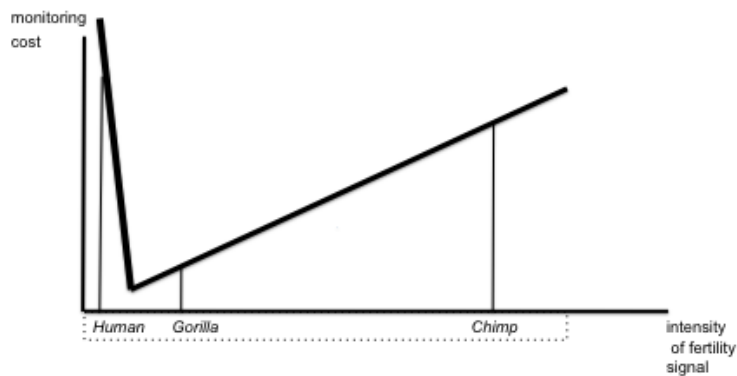
¹² Our hypothesis implies, therefore, that alternative fertilization systems involve different levels of social complexity and have a fundamental role in shaping intelligence. Also Dumba (2007) argues that there is a relation between social complexity and brain size, supporting a development of Macchiavellian social intelligence. Dumba (2007, p. 649) emphasizes that group size 'is at best a crude proxy' for the complexity of social relations. Indeed, the social relations of gibbons are complex and involve the development of sophisticated capabilities, but gibbons end up as isolated, small social groups where a couple controls and its offspring control a certain territory.

or female ancestors. Women are generally thought to possess sweeter voices than men, and as far as this serves of any guide, we may infer that they first acquired musical powers in order to attract the other sex. But if so, this must have occurred long ago, before our ancestors had become sufficiently human to treat and value their women as useful slaves’.

We will argue later that the massive enslavement of women and, in general, of other people became possible later with the settled agricultural communities. By contrast, in the hunting and gathering phase, human gender relations could evolve along paths different from those of the other primates.

In the case of other primates, the diverse nature of the female fertility signals had very different consequences on the investments that the (male) members made to increase their reproductive fitness. Both chimp and gorilla females signal sexual availability in a mechanical and evident ways. For both sexes of these two primates, the fertility period is no mystery. However, female chimps and gorillas differ in their fertility advertising strategies: the former produce a strong and prolonged signal while the latter give a weak and relatively short hint as to their fertility state. The different costs of males' exclusive accesses induce different types of investments, even if they share the characteristic of involving parts of their bodies different from the brain.¹³ Humans had a unique fate: their fertilization system allowed them to overcome the ‘infant industry’ problem of ‘brain-development’, which acted as an insurmountable barrier for other species.

¹³ Male chimps have little incentive to make positional investments in their body sizes, which are not substantially greater than those of females, to fight for a too costly exclusive access. By contrast, because of their almost private weak and short fertility signal, female gorillas have given strong incentives to gorilla males to make positional investments in their body size. An opposite picture characterizes the biological investments of these two species in their testis sizes. The promiscuity due to the females' long and prolonged signals induces chimps to make major investments in their insemination capacities while the monopoly situation enjoyed by the male gorillas in their harems explains the small size of their sexual attributes. For a more detailed analysis see Battistini and Pagano (2007).



Humans were likely to move from a dominant-male polygyny to pair bonding arrangements among individuals who, unlike gibbons, lived in large groups – ‘a feat accomplished only by homo sapiens’ (Gifford, 1999 p. 138). The move was likely to be a sudden one. A decrease in the intensity fertility signal decreased monitoring costs and may have allowed a move from the promiscuous arrangements of chimps to the harem solution of gorillas. It was also associated with increased sexual dimorphism because the lower monitoring costs generated selective pressure toward increasingly large males since size conferred an advantage in fights to gain exclusive access to the easy-to-monitor females.

However, once the intensity of the signal became sufficiently low, the monitoring costs sharply increased because it was impossible to know in which period which female was fertile and worth controlling. At this point the tendency towards sexual dimorphism may have been sharply reversed. Such a sudden reversal may be consistent with the fact that, while there was a large difference between australopithecine males and females, by the Middle Pleistocene period sexual dimorphism among humans was comparable to that of modern human populations. Brain intensive investments in the complicated pair bonding agreements in large groups were likely to pay more than investments in increased body size. Sexual selection stopped favoring sexual dimorphism. The individuals of both genders could increase their mating opportunities by investing in brain size and in the intellectual capabilities necessary to structure complicated pair-bonding agreements. ‘These agreements, necessary for the stability of pair bonding in large groups represent perhaps the first long-term institutional relationship that was recognized as such by the participants’ (Gifford 1999, p. 138).

In the case of humans, the positional competition associated with sexual selection implied the

production of public goods such as communication, language, and (emotional and rational) intelligence¹⁴. The ability to understand the point of view of others, the comprehension of social interactions and, finally, the feeling and awareness of being a member of society became important attributes for transmitting one's genes. The development of these human capabilities may initially have been very costly.¹⁵ For instance, without an articulated language and a developed culture, the benefits of a large brain could not compensate for the high cost of delivery and the low motility of human infants (both of which features are due to the large size of their brains). However, after a while, the human species, endowed with common understanding, sophisticated language, other forms of reciprocal intelligence and other complementary characteristics,¹⁶ developed unprecedented abilities to hunt, to gather, and in general to cope with nature.

Reciprocal intelligence allowed efficient cooperative hunting of large prey, which would quickly deteriorate. In this way, communication in production was accompanied by food sharing in consumption, differentiating humans from the other, more hierarchical primates. The equality and the productivity of our species were related to human intelligence and communication. While Wallace could not explain these early features of humankind, Darwin indicated the route by which sexual selection could subsidize human intellectual capabilities. Concealed ovulation and female

¹⁴ 'A neural model supported by a significant amount of neuroscience evidence supports the view that the brain employs Bayesian strategies at close to optimum levels in decision making. Embedded in our symbolic culture and institutions, these decision-making processes make simulations of possible future to estimate the discounted expected benefits and costs of the various alternatives.' (Gifford 2009 p. 244). In this sense, intelligence is both emotional and rational and does also include our remarkable capability of dreaming.

¹⁵ Large brains are very costly. What matters is having a big brain in proportion to the body so that the brain-power is not completely dedicated to its management. 'What counts is not total brain size but rather brain size adjusted for body size' (Gifford 1999, p. 135). For instance, in spite of their remarkable intelligence, at about 10 g. the absolute size of corvid brains is rather small but their relative size is much larger than in other birds except parrots. Moreover, birds have much smaller cells than mammals. This feature 'combined with higher packing density, could result in a much higher number of pallial-cortical neurons in corvids compared with mammals with the same brain or cortex size' (Roth, Dicke 2005 p. 256).

Roth and Dicke data (2005) are taken for adults. However, what may matter the most is the relative size of the brain in infants of the different species. Intelligence is the outcome of a long-term investment requiring a substantial allocation of resources to a large brain in a very early stage of life. Casual evidence would suggest to me that humans allocate a disproportionate amount of resources to the brain in the first months of their life, impairing the motility of infants to an extent that cannot be found in the other species.

¹⁶ Other, complementary characteristics are also necessary to make a large brain advantageous in terms of sexual selection. They include a long life and menopause. A long life is necessary to recoup the initial high costs, sustained by infants and parents, of brain development (Kaplan, Lancaster 2003 and Robson, Kaplan 2003). Menopause becomes necessary because a large brain means that infants lack independence and mothers may easily die during delivery. Each new delivery entails a serious risk, not only for the mother but also for the other children, who cannot independently survive. It therefore pays to cut off the process at a certain point well before what happens in the other species. Together with concealed ovulation, menopause is another almost unique characteristic of the human (female) fertilization system (Diamond 1998).

For the general formal differences between single-gene and multiple genes evolution models with interlocking complementarities (or epistatic interactions) see Feldman (2001). Commenting on David (1985), Gould (1992) observed how the fundamental similarity between the complementarities that were constraining the development of the panda's thumb and those which were locking in the evolution of the QWERTY keyboard. Pagano (2011) considers how the degree of complexity of the units influences their evolutionary possibilities in both natural and social histories and argues that things analogous to taxes, subsidies and protectionism exist also in the realm of natural selection.

selective receptivity contributed to create the typical human conditions of reciprocity, sympathy and exchange (Battistini, Pagano 2008), which Adam Smith understood to be the specific characteristics of humankind.¹⁷ Human intelligence or human consciousness share a common origin with human moral sentiments in the evolutionary advantages of understanding the minds of the other individuals and, indeed, ‘morals are a shared understanding, within a group of people, of how to live and work together’.

According to Antonio Damasio (1999 p. 127) ‘the essence of core consciousness is the very thought of you – the very feeling of you – as an individual being involved in the process of knowing of your own existence and of existence of others’. This understanding is inevitably reflexive. Understanding others involves understanding how others understand ourselves and involves considering our own mind as an object of our analysis. Looking inside ourselves was as evolutionary advantageous as understanding others and their intentions. Moreover, the former capability could not really be disentangled from the latter. The awareness of the ends of the self and of the ends of the other individuals enhance our capability to dominate and manipulate others¹⁸. However, the same awareness makes it also possible to follow complex moral behavior. For instance, consider Kant’s (1785, p. 178) famous ethical principle states: *Act to so treat man, in your own person, as well as in that of everyone else, always as an end, never merely as means*. This principle can only be followed by a species whose individuals are capable looking from some fair standing their own and others’ ends and are able to share their intentions.

While shared intentionality involves both emotional empathy and reciprocal rational understanding, it relies on shared common frames or, in other words, on the development of common cultures (Tomasello et al. 2005). Thus, the same social capabilities, that are necessary for complex moral behavior, are also required for the development of shared cultures and languages. Human communication relies on joint attentional frames within which each individual can understand and can emotionally share the interests of the others. This common ground involves that a simple gesture, such as pointing at something, can take complex meanings which cannot have in other species. The latter are unable to share intentionality and to point at what may interest the other

¹⁷ How far these characteristics extended beyond small groups, before pre-historic times, is an open issue. Unfortunately, a successful reproductive strategy could have been to use love and communication with the women of the group (and allied groups) and rape with female enemies. This point would be consistent with the high frequency of wars among early human communities (Choi and Bowles 2007) and the fact that still today wars are associated with major outbreaks of sexual violence, even if the causes of this violence are quite complex and their nature varies among wars (Wood 2006). Note that, in this case, the unique human fertilization system would have had an unfortunate consequence: since all women could potentially be in their fertility period, widespread rape could increase reproductive fitness.

¹⁸ This link between knowledge and manipulation is a distinctive feature of human affairs. For this reason, their understanding must often find paths different from those favoring the knowledge of the laws chemistry or physics. The alchemists made a mistake in trying to alter the nature of metals by incantation. However, if they had tried with financial markets, they could have succeeded (Soros, 1987).

individuals (Tomasello 2003, 2008).

However, under the exceptional conditions of the human fertilization system, both romantic melodies and meaningful gestures were not enough for reproductive deals to be struck between men and women. Articulated languages¹⁹ became even more necessary for more complex exchanges and for structured social interactions, involving a larger number of people. Only after the development of these languages, beneficial Smithian competition could become as relevant as the Hobbesian competition for zero-sum positional goods such as rank and status²⁰.

If the origins of human virtues lie in the cooperative and sophisticated relations between women and men, it seems sterile to distinguish between marriage and prostitution, as if they were not both forms of sexual exchange and specific characteristics of humankind. The crucial distinction becomes that between two other settings.²¹ The first takes for granted that each individual is entitled with the self-ownership of his/her own body and that this is a precondition of any fair exchange. The second expropriates these basic rights from women, making them objects of sexual exchanges that others carry out.²² In this second case, the fact that sexual exchange takes the name of prostitution or marriage is not relevant. In both cases, a crime has been committed against basic human rights and, in particular, against those ‘natural’ rights, concerning sexual relations, that marked the very beginning of human development.²³

4. War and love in early human societies.

Both purchased and romantic love, as well as any mix of them, contributed to the development of human knowledge and, in general, to human civilization. In the hunter-gatherer societies the development of human culture allowed for new evolutionary mechanisms which differentiated humans from the other species. Human interactions could quickly evolve in many different ways

¹⁹ The human hardware for an articulated language involves sharp qualitative differences from other animals. There are two different language systems in the human brain one involved with lexical/semantic language and the other with grammatical language. The existence of the latter distinguishes us from other primates. One of the two systems can be impaired while the other works inducing two different types of aphasias (Ardila, 2011).

²⁰ Some form of ‘biological markets’ (Noë R., Hammerstein P., 1994) exist also in other species but the development of exchanges yielding mutual benefits requires fairly complex communication capabilities.

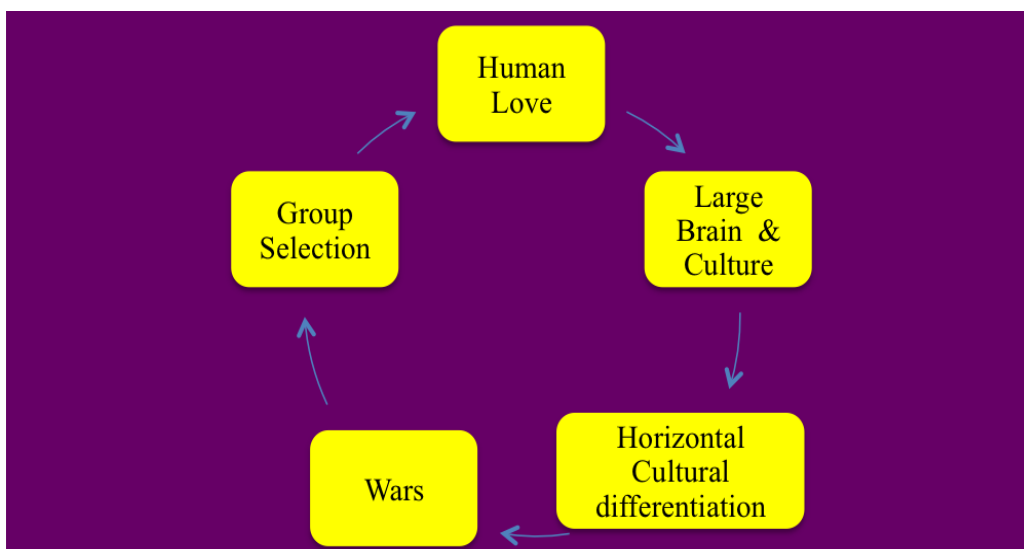
²¹ This distinction is the basis of the excellent empirical work on the sexual exploitation of trafficked women done by Bettio and Nandi (2010) and Di Tommaso et al. (2009).

²² Other barriers range from the occupational purdah preventing some Indian women from working even in the face of starvation (Chen, 1995) to the invisible cultural walls that surround many modern occupations in the world of global finance (Staveren 2002).

²³ This point is consistent with universalistic foundations of these rights and in contrast with the cultural relativistic

and a plurality of institutions became a specific characteristic of the human species. Group selection due to differential abilities to deal with nature and to widespread warfare became one of its more typical features: thanks to love, humans developed different cultures, and cultural differentiation produced strong identification with particular groups. In this sense love, by allowing culture and cultural differentiation, produced war. In its turn, war selected more cooperative groups and, hence, produced some kind of intense love associated with hatred of the enemy.

Thus love gave rise to war and war gave rise to love. The two mechanisms are far from incompatible and they define a self-reinforcing equilibrium which may have characterized the small hunting and gathering communities in which humankind spent such a disproportionate part of its history, shaping the fundamental characteristics of human nature.



The first mechanism (*Horizontal cultural differentiation* → *Wars* → *Group Selection* → *Human Love*) is well established in the current economic literature, and the idea that War favors cohesive groups has ancient origins. In Western culture it can certainly be found in Greek mythology, where Harmonia was the Goddess of both Love and War²⁴ This *Classical hypothesis* relies on the idea that conflicts among culturally differentiated communities stimulated a co-

views. On the merits of the former view and the shortcomings of the latter, see Nussbaum (2000).

²⁴ Harmonia was given as bride to Cadmus, the founder of Thebes, who had saved Zeus from the monster Typhus. Her own fate and that of Thebes show that her mission was a failure and originated the great tradition of Greek tragedy. She was the daughter of the God of Love and of the God of War and embodied the idea that Harmony required both Love and War. Harmonia was a Goddess of parochial altruism. A modern evolutionary foundation of parochial altruism can be found in Bowles and Gintis (2001 and 2011). Choi and Bowles (2007) and Bowles (2009) focus on the disproportionate importance that organized group warfare had on human evolution. While some recent evidence (Mitani, Watts and Amstler 2010) shows that also chimps have forms of organized group warfare, there is no doubt that its evolutionary importance is almost unique in the case of human evolution.

evolution of inter-group hate and intra-group love. Accordingly, quasi-monogamous love relations can be seen as the outcome of a search for intra-group harmony: an unequal distribution of women would have endangered the group's cohesion. The hiding of sexual attributes, and perhaps even concealed ovulation, can be interpreted in the same terms.

The second mechanism (*Human Love* → *Large Brain & Culture* → *Horizontal cultural differentiation*) has been less popular in recent evolutionary literature. It is, however, well illustrated in the biblical story of the Tower of Babel. According to this story, humans, endowed with one language and a common speech, were aware of the enormous strength of their unique culture²⁵ and tried to build a tower which would reach the heavens. A jealous God confused their languages,²⁶ causing the formation of different ethnic groups which were unable to understand each other. Even if it is expressed in a mythical narrative, the *Biblical hypothesis* makes the convincing point that some unique human culture must have been developed before cultural differentiation and inter-group warfare. Because of mechanisms relying on sexual selection, an undivided human culture flourished and preceded its differentiation. Indeed, no cultural differentiation would have been possible in the absence of a culture to be differentiated. In this sense, sexual selection must have first subsidized both the software and the hardware of human intelligence, creating the conditions for subsequent cultural differentiation and ethnic conflict. Thus, the *Biblical hypothesis* has some priority on the *Classical hypothesis* in the sense that war among stable ethnic groups became possible only after humans had been able to produce a culture and a language that had no significant precedent in natural history.

Moreover, war reinforced (some sort of) intra-group love only under the special conditions of hunting and gathering societies. Only in this setting, the mechanisms underlying the Classical and the Biblical hypothesis are not logically inconsistent and can even be integrated into one single mechanism. In general, the warfare among groups with different cultures also had the potential to undermine the egalitarian arrangements of the early human societies. This would not happen when the losers were eliminated or absorbed into the culture of the winners, but it was a very likely outcome if they were forced to become their servants in hierarchical societies based on cultural discrimination. This second possibility was not a serious threat for the egalitarian structure of the mobile and small hunting and gathering societies whose most important resources were public goods such as the knowledge about prey and cooperative hunting technology. In this situation the

25 More precisely, '...there are three important requirements for the development of a culture: (1) an ability to think symbolically, (2) the related ability to use a language, and (3) the ability to consciously think about the future in a complex manner' (Gifford 1999, p. 129).

26 According to the Bible the Lord said: 'If as one people speaking the same language they have begun to do this, then nothing they plan to do will be impossible for them. Come, let us go down and confuse their language so they will not understand each other'.

enslavement of the losers was as difficult as the control of large harems. However, the hidden potential of warfare to generate inequality was to become well evident in agrarian societies, which involved long-term immobility and the control of a territory whose fruits could only be reaped a considerable time after the application of human effort.

5. Social positions and private wealth: the agrarian-industrial U-turn.

Forms of elementary property rights characterize most species. Hunting and gathering can involve some degree sophistication in property rights, especially those concerning large prey, requiring often the cooperation of many hunters, which, in the absence of means of storage, cannot be eaten by one individual alone. However, the long production time of agriculture activities involved much more sophisticated rights which established in advance how the long-term benefits of those activities were to be distributed²⁷. The differential access to land and to its products allowed the exercise of power over other individuals. It also transformed human gender relations: some humans started having harems more numerous than those of the strongest gorillas.²⁸

Agricultural production required sophisticated property rights and stimulated their careful definition and enforcement. The argument developed in the preceding section offers a possible solution to the puzzle of human pre-adaptation to the institutional requirements of agricultural production. The complex mating system of humans may have stimulated abilities to develop long-term rights on their sexual partners. This ability is likely to have been extended from humans to things. Long-term rights on other individuals are likely to have pre-adapted humans to the institutional requirements of agricultural societies. Paradoxically, the symmetric love affairs of the early hunting societies and their unfettered intergroup fighting may have created the conditions for the development of the hierarchical and culturally differentiated agrarian societies.

Agriculture techniques are likely to have been selected for their greater productivity in

²⁷ Gifford (2002) observes that, whereas the transition from the social contract of the great apes to that hunter-gatherers human societies involved changes in both the biological and social structure of early hominids, the move to agrarian societies was only related to a radical change in the social structure. The human biological hardware, built under the 'Coasian' social contract of hunter-gatherers, maintained a taste for liberty under the new hierarchical social structures.

²⁸ And the analogy between humans and gorillas could be remarkably appropriate. Gorillas had evolved a digestion technology which enabled them to survive with a surprisingly narrow variety of food from a limited territory. In spite of their delicate digestive systems, also humans could be enclosed in limited spaces where their technologies and some early trade supplied a sufficient variety of products. In both cases limiting the space allowed an increase in sexual and social inequality. However humans were able to push sexual and social inequality well beyond gorillas. While male gorillas could only invest in differential body size, male humans could invest in armaments, wealth and servants. In many cases, a 'new gender' (the eunuchs) was created transforming potential male competitors in guardians of exclusive sexual access (Ringrose, 2006). After many centuries, the same practice was still common in some parts of Romania, where the slavery of the Romani (Gipsy) people was only abolished in 1864. 'Among the house slaves were

comparison with the hunting and gathering technology. One cannot, however, exclude the possibility that, in culturally and socially divided human societies, agriculture techniques became convenient even when their overall productivity was inferior to those of the hunting and gathering societies. If warfare meant that cheap slave or serf labor²⁹ was available, then agriculture could become convenient for the winners even when its productivity was lower. What mattered for the winners was the overall cost, which included monitoring the work of the losers. The transition to agriculture may have lowered monitoring costs to such a degree to compensate for an increase in production costs. The property rights of agrarian societies could have made agriculture attractive for the winners even in cases when it was technologically inferior to hunting and gathering.³⁰

The long-term security of property characterized not only agrarian but also industrial societies. Both societies were organized according to hierarchical social positions related to the exclusive access to private wealth. However, the relation between social positions and access to wealth is almost inverted in agrarian and industrial societies and has greatly contributed to making the difference between the stagnant nature of the former and the innovative nature of the latter.

In agrarian societies, coercive power and status determine the access to wealth. The positions of individuals in society in terms of power and status are relatively fixed and, usually, given by birth. They determine the access of individuals to the various occupations and to the available wealth. Both the main means of production (land, buildings and domesticated animals) and the products can be stored and distributed unequally. The opposite direction of causality (from occupations and wealth to power and status) is much weaker and it is often explicitly repressed in these societies.

In an industrial society (this term, used by Ernest Gellner³¹, can be interpreted as the common features of different models of capitalism) causation flows mainly (but not only) in the opposite direction. The positions of individuals are not given in terms of power and status, while access to education, occupations and wealth accumulation is not explicitly precluded to any individual. While

scopity, male, castrated as not to present a threat to the noblewomen whom they served' (Hancock 2002, p. 20).

²⁹ Bowles and Choi (2011) provide some evidence that agricultural techniques were inferior when they were first introduced. Thus, according to them, the 'first property right revolution' cannot be simply explained in terms of technological improvements. Richerson et al. (2001) explain the move to agriculture to climate change and population pressure.

³⁰ History does not have the unilinear development as implied by the 'efficiency, mechanistic' versions of Marxism and New-Institutional Theory (Pagano 2007d). Technologies influence property rights and institutions, but also the opposite is true (Pagano Rowthorn 1992). Indeed some empirical studies (Earle, Pagano, Lesi 2006) show that, in some cases, the latter direction of causation may be stronger.

³¹ The influence of Ernest Gellner (1983, 1998,1999) is evident in this section . I have tried to summarize his contributions and to point out their importance for economists in Pagano (2003). While giving an important role to economic factors, Gellner considers ethnic identities and nationalistic feelings as important causes of modern conflicts. In this sense, his theory is in sharp contrast with the 'neoclassical theory of conflict', which centers on the trade-off between production and appropriation. For an evaluation of this theory, see Cramer (2002).

status and power can sometimes favor access to certain occupations and to the accumulation of wealth, this relation is rather weak and is not typical of an 'industrial society'. The opposite is true. The accumulation of wealth (and of the human capital necessary for access to certain occupations) is now the means by which individuals can acquire power and status.

We may simplify the argument by saying that, whereas in an agrarian society a given distribution of status and power determines the distribution of wealth, in an industrial society the production and distribution of wealth determines the distribution of status and power. In other words, under the two social arrangements, causation among power, status and wealth flows in two opposite directions.

The positional nature of status and power affords better understanding of the implications of the opposite flows of causation that characterize industrial and agrarian societies. In an agrarian society, the distribution of power and status is fixed by birth and determines access to wealth. For this reason, there is little incentive to innovate and to accumulate wealth. War and coercion are rather the means to become wealthier and explain the positional struggle existing in these spheres. In this situation, social scarcity strongly constrains natural scarcity. The allocation of power and the status positions are fixed in ways which, destroying the incentives to produce wealth, inhibit a process of economic development. In welfare terms, we are very likely to have an 'under-accumulation' of wealth. By contrast, the positional competition for power and status which characterizes industrial societies involves the private (over-) accumulation of considerable amounts of private physical and human capital³².

In culturally differentiated agrarian societies, the power and status structure is rather impermeable to the differential accumulation of physical and human capital. By contrast, in cultural homogeneous industrial societies, this differential accumulation of capital generates a vigorous positional competition. In agrarian societies, cultural differentiation is a cause and an effect of social and geographical immobility, whereas in industrial societies cultural homogenization co-evolves with social and geographical mobility. Because of these different internal social dynamics, the transition from agrarian to industrial societies was bound to be difficult, and it is a great merit of Ernest Gellner to have shown the exceptional circumstances that, in a couple of countries, allowed these interrelated mutations to take place.³³ In both cases, similarly to the case of complex

32 Some primate societies such as that of velvet monkeys females (who do not leave natal groups) inherit their dominance rank from their mothers while males (who, at certain age, migrate from their groups) undergo a fierce positional competition. One could say that females have agrarian social arrangements, while males have mobile and competitive relations. In an interesting field experiment, Riccardo Pansini (2011) has shown that cooperation, induced by artificial feeders requiring joint effort, reinforces the hierarchical behavior of this primate society.

33 According to Gellner (1998, 1999), these circumstances can be seen as a marriage between a high culture (with a written language, etc.) and a political elite, identified with this culture, which had the power to popularize it. England

organisms, a set of interlocking complementarities may cause long periods of stasis: cultural differentiation blocks social mobility, and social immobility blocks cultural standardization in the same way as epistatic interactions may block the evolutionary change of a complex genotype.³⁴

However, when, in a couple of countries, the interlocking complementarities of agrarian societies were broken, these social changes spread very quickly to other parts of the world. Social mobility and cultural standardization allowed the exploitation all sorts of opportunities and engendered the vigorous process of creative destruction characterizing capitalist society. Socially immobile and culturally differentiated societies were inevitably left behind in terms of economic development and, as a consequence, also in terms of economic power. Moreover, countries which had become culturally homogeneous nations could not be easily conquered; instead, they could easily colonize the hierarchical agrarian societies. Homogeneous nation states developed an internal solidarity that made external domination very difficult. By contrast, agrarian societies could be easily conquered by national states: foreign domination simply involved adding a layer to their hierarchical structure – an irrelevant issue for the large majority of the people.³⁵ By contrast, national states could rely on the ancestral sense of belonging to small homogeneous communities fighting with the other communities. In the words of Benedict Anderson (1991), they were ‘imagined communities’ and they could claim to be natural and ever-lasting institutions to which humans had always belonged independently of their will. Their immortality could give humans the stability and the meaning that the fragility of their short lives failed to provide.

Indeed, with the diffusion of nation states and industrialization, humanity seemed to have made a full circle. After the long agrarian interval, it had returned to a large scale re-make of the original organization of communities fighting each other. However, even more than in its early small scale version, for humans war did not simply promote love for their own communities but produced violent conflicts, genocides and exploitation, that is, increasing hate for other imagined communities. The last world war made very evident the dramatic consequence of nationalism in terms of a possible extinction of the human species. The organization of humankind could no longer

and France were the first to exit the agrarian conditions because both the bride (the high culture) and the groom (a potential national state) were available. Germany and Italy had a bride (an undisputed high culture accepted over a well-defined territory) but they lacked a centralized power that could popularize this culture. A process of national unification was required to find a groom for the bride, and those countries were able to follow the same process only after some decades. Finally, the process was slow and painful in places lacking both the groom and the bride.

34 ‘much of macroevolution cannot be explained by atomistic genes replacements or by selection pressures on single genes, but only by a more drastic reorganisation, made possible by loosening the tight genetic cohesion of the genotype found throughout widespread populous species.’ (Mayr, 1988 p. 471) This tight genetic cohesion among genes, which in biology takes the name of epistasis, entails that, similarly to complex institutions, complex organisms undergo long periods of stasis (Pagano 2011).

35 A Neapolitan proverb expresses this point rather well: ‘la Francia o la Spagna, l’importante é che si magna!’ (France or Spain, what matters is eating!)

take the form of unfettered combat among rival communities.

6. Social positions and knowledge in the global society.

Cultural homogenization yielded rewards for productive and innovative effort independently of the social and geographical positions of individuals. It created strong incentives to develop the economy. Moreover, while the rewards for success were enhanced by cultural homogenization, the risks of failure were decreased by it. Because of cultural homogenization, investments in human capital became more liquid and, in the case of failure, more easily reversible to alternative uses. In the process of creative destruction, successful creation was now rewarded while, at the same time, the costs of destruction and failure were decreased by the enhanced reversibility and liquidity of human skills. Development and continuous structural change retroacted on cultural homogenization. If the emergence of mobility and markets required some minimum degree of cultural homogenisation, their development implied a large further increase in cultural homogenisation that, in most cases, strengthened feelings of national solidarity.³⁶

While the national state had originated this self-reinforcing process, it opened a Pandora's Box of cultural and economic winds that could hardly be contained forever within the boundaries of nation states. Some national states (Britain with its Commonwealth and United States with its federal system, its frontier, and its melting pot of different ethnic groups) developed a sense of 'global mission' and started doing to other languages and traditions what the nation state had done within its own boundaries. Some advantages of mobility and cultural standardization could now be reaped at a global level while, at the same time, for some individuals locked in losing national cultures, there was often a simultaneous shrinking of economic opportunities (Pagano 2007b).

At the same time, increased mechanization, as well as new information and communication technologies, gave rise to dramatic change in the structure of the inputs of production.

The intensive use of private land and capital and the production of storable output differentiated both agrarian and industrial societies from the primitive communities. In primitive communities, knowledge (about the prey and the wild fruits of nature) and communication were

³⁶ Cultural homogenization and solidarity are thus two complementary aspects of nationalism. At the same time, they are also substitutes in the sense that they can act as alternative insurance devices against the risk associated with the specialisation of skills in a mobile market society. On this point see D'Antoni and Pagano (2002) and Bowles and Pagano (2006)

used more intensively than other forms of capital. Moreover, products (especially big prey) could not be stored and, therefore, could be fruitfully shared. Samuel Bowles³⁷ has advanced the suggestive thesis that the knowledge-intensive economy would mark a return to the early times of our species: if ideas become the main means of production, many inputs of a modern society will share the same public-good characteristics of those used in the hunting and foraging communities. Ideas (in the form of continuous innovations) are non-rival goods; when one of them is caught, it can be consumed by more people than the largest deer. While in the agrarian and industrial stages, the private appropriability of most inputs and products had enhanced inequality, the public goods of the knowledge economy may favor a return to a more egalitarian society. There is an increasing tension between the fundamental determinants of contemporary society and the prevailing private structure of its property rights. In the words of Kenneth Arrow (1996, p. 651) ‘Information overlaps from one firm to another, yet the firm has so far seemed sharply defined in terms of legal ownership. I would forecast an increasing tension between legal relations and fundamental economic determinants. Information is the basis of production, production is carried on in discrete legal entities, and yet *information is a fugitive resource*, with limited property rights’.

If these predictions are correct, the future society would be more consistent with human nature as it had evolved in its long hunting and gathering phase. Not only social differences but also gender inequality would be greatly decreased in this new setting. While, similarly to many other animals, human males were physically stronger than females, intellectual capabilities were shared and developed together since the dawn of the human species. A knowledge-intensive society would make these common intellectual capabilities a central feature of the production process and render the physical advantages of males irrelevant.

However, while it is true that physical strength has decreasing importance in production, it is not clear that a knowledge-intensive society is necessarily more egalitarian. The analogy between ideas and the big prey of the hunting societies is appropriate: ideas are indeed bigger than the biggest prey because each piece of knowledge can nourish all humans at no additional costs. To use Jefferson’s vivid image,³⁸ knowledge is like the flame of a candle that can light many other candles without decreasing its own flame. However, the potential public use of knowledge, which is due to

37 ‘The information-intensive economy of the future may more closely resemble the economy of the mobile foraging band in human prehistory rather than the economy of grain and steel that displaced it. Pursuing good ideas with practical applications is a costly and uncertain project, much like hunting a large game. Success is rare, but its fruits are immensely valuable. The private appropriation of the prize is both difficult to accomplish and socially wasteful.....’ (Bowles 2004, p. 501).

38 ‘He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me’, Thomas Jefferson, Letter to Issac McPherson, ‘No Patents on Ideas,’ 13 August 1813. Sometimes paraphrased as ‘Knowledge is like a candle. Even as it lights a new candle, the strength of the original flame is not diminished.’

its non-rival nature, does not make its private appropriation impossible. By contrast, the private appropriation of knowledge limits the freedom of others much more than the privatization of material wealth.

The recent reinforcement and extension of intellectual property have been compared to the enclosure of land that preceded the industrial revolution.³⁹ Also in this case, some local public goods were turned into exclusive private property. There are, however, fundamental differences. In the case of land, the object of privatization was a local common that involved the legal positions of few individuals. By contrast, the privatization of intellectual property changes the legal positions of many individuals and has major implications for the international standings of the different countries. Moreover, because of its non-rival nature, unlike land, knowledge can be used by many individuals without decreasing its value. Thus, the non-rival nature of knowledge makes its privatization much more limiting for the liberty of other individuals. Privatization turns the ownership of a piece of public knowledge into a ‘pan-positional’ right that involves a reduction of liberty for all the other individuals. In this sense, it has little to do with the traditional rights of exclusive consumption enjoyed by the owners of material objects. The non-rival symmetric nature of the consumption of knowledge becomes, paradoxically, the cause of a sharp asymmetric division. The domain of the rights of some individuals is greatly extended, while the range of the liberties of other individuals is dramatically restricted. To use Jefferson’s vivid image again, the exclusive ownership of the flame can only mean that others are not free to light their own candles. The rival nature of land implies that its private ownership restricts the liberty of non-owners only in the few cases in which it interferes with the (necessarily local) private uses of a piece of land. The private appropriation of knowledge cannot imply that the liberty of the non-owners should be limited only when it interferes with the consumption of the owners: because of the public nature of knowledge, this never happens. Because of non-rivalry, one flame never decreases the intensity of another flame. The nature of ownership is here, necessarily, much more restrictive: it means that non-owners have no liberty to ‘light their taper’ and use their own flame without the permission of the owner. This is more restrictive than simply non-decreasing the ‘flame’ of the owner as the analogy with land would imply.

It is a well-known piece of economic theory that the non-rival nature of a good should not be the cause of an excessive restriction of liberty, but rather a reason to grant all individuals the liberty to light their own flames. There is, however, also a standard argument that can support this restriction: if the person that has borne the cost of lighting the first candle is not compensated for this effort, perhaps the overall flame of knowledge would be weaker. According to this view,

39 For instance, see Shiva (2001: pp. 44-48). This section also draws on Pagano and Rossi (2004) and Pagano (2007c).

appropriate incentive for the inventor requires that s/he becomes the owner of the knowledge that s/he has discovered and that the liberty of access of others is restricted⁴⁰. However, this restriction is always costly: after the first discovery: many other candles could have been lit, in some cases also independently, without decreasing the flame of the first candle.

The cost of depriving other candles of the flame increases when the knowledge is ‘basic’ in the sense that it occurs upstream in the production of other knowledge, or it is ‘complementary’ to other pieces of knowledge. Moreover, the unrest due to the monopolization of knowledge increases with time. The reinforcement and the up-streaming of intellectual property rights may initially even increase investments in search of future monopoly rents to be earned on a virgin territory. However, after a while, the risks of the investment landscape change dramatically because most investments in new knowledge run the risk of being blocked by the monopoly rights of others. Eventually, the incentive of the future rents from intellectual property becomes weaker than the fear of incurring losses due the blockage of others’ intellectual property, and overall investments tend to decrease⁴¹.

Independently of the risks of a (current) great depression, the new knowledge economy may end up becoming hierarchical and divisive. A shirking group of firms enjoys a virtuous circle where the security yielded by a large package of intellectual property gives incentive to invest in skills specific to their improvements which in turn increase the ownership of intellectual assets. By contrast, many individuals may fall into a vicious circle: the lack of intellectual property inhibits the investment of human capital and, vice versa, the consequent absence of skills prevents those individuals from acquiring intellectual property.

Because of these divisions, the knowledge-intensive economy may be far from re-creating on a global scale the public-good-sharing conditions of the early hunting and gathering communities. By contrast, a global economy without global political institutions may depart from the internal solidarity and culture cohesiveness of the national state and may show a paradoxical return to some features of agrarian societies. A new global elite may live on the rent from intellectual capital rather than on that from land and, as in the Middle Ages, may develop a cosmopolitan culture that differentiates it from the majority of the people.

⁴⁰ Boldrin and Levine (2008) criticize this view and advocate a world without intellectual property. See also Gilbert’s (2011) review of their stimulating book.

⁴¹ For the role of intellectual monopolies in the current great depression see Pagano and Rossi (2009)

7. Conclusion.

For ninety-nine percent of its history, our species used mainly public goods like language and communication as the most effective tools in hunting, and it shared large prey. No stable dominant position and no great differential in wealth could be established in those societies.

With the advent of agrarian societies, culture was transformed from the common good of the hunting groups into a source of social, ethnic and gender differentiation. Cultural differentiation was extended from a horizontal to a vertical dimension. Vertical cultural barriers became the foundation of a natural organization of society and were rarely openly challenged. However, the cultural domestication of humans in vertical social positions had a limited success. It clashed with the culture of social solidarity developed in the small primitive human societies which had shaped certain universal human values and needs.⁴² After centuries of cultural differentiation, the slogan ‘one people, one nation’ exerted a strong appeal on the human imagination. In some countries, the challenge against traditional social and gender cultural barriers enjoyed strong and immediate popular support. Unfortunately, also the ancient tradition of human warfare exerted a similar appeal, and the accumulation of physical wealth produced new vertical differences in the relative positions of individuals, within and among nations.

The knowledge-intensive economy has again made public goods (or at least non-rival goods) the fundamental factors of production. It offers the possibility to create a global village that fits the cooperative roots of our species which may now be extended to the entire planet. This is a real possibility in the sense that human love does not need war and can flourish without co-evolving with hate. War among culturally differentiated groups came at later stage and had ambivalent effects on their social organization. At the beginning, it may have reinforced the solidarity of the hunting communities, but it ended up favoring the transition to the hierarchical world of agrarian societies.

However, our roots may at most say how human needs can be better satisfied. Unfortunately, also other outcomes are possible. The privatization of knowledge can also generate a global economy with inequalities that, until recently, were unthinkable within national states. It may even mark a paradoxical return to the privileges and deprivations that seemed to have disappeared together with agrarian societies: a global elite, living on the monopoly rents of intellectual property, would replace the land-owning aristocracy of the past. Even if a well-defined specific human nature

⁴² Tolerance and understanding of others' points of view is one of the most important human universal values, and it is exactly its universality that makes normative relativism self-subverting: ‘for, in asking us to refer to local norms, it asks us to defer to norms that in most cases are strongly non-relativistic. Most local traditions take themselves to be absolutely, not relatively, true. So, in asking us to follow the local, relativism asks us not to follow relativism.’

is grounded in our evolutionary past, one cannot exclude that human history may unfold in a direction that increases the distance between us and our roots. We can only try to act against this possible outcome. This time, it will be difficult to blame a jealous God for our failure.

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