

Reconciling *homo-economicus* and *homo-social* with the *homo-sapiens* of biological evolution: The concept of extended identity

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Abstract

This paper takes it as given that although the human self, contrary to orthodox assumption in economics, is not a wholly atomistic egocentric being, neither is it a completely social construct as assumed in some social sciences. As a means of linking *homo-economicus* and *homo-social* to the biological nature of *homo-sapiens*, this paper introduces the *concept of extended identity*, which treats the human self as a cultural and experiential expression of an elastic biological foundation.

Key words: extended identity, extended phenotype, selfish gene, asymmetric information, evolution, trust, social capital, imperfect information, *homo-economicus*, homo-social

Introduction

Following the path-breaking systematic introduction of the concept of evolution by Darwin (1872) to explain the complex design of living things and the refinement of Darwinian ideas by Neo-Darwinians like Smith (1982 and 1988), Hamilton and Axelrod (1981) and others, the idea of biological evolution based on gene selection is a well-accepted scientific theory within the natural sciences. Those ideas are reviewed in detail and robustly summarized by Dawkins's (1982, 1986, 2006), with the metaphors of selfish gene and extended phenotype, the idea being that selfish genes compete for survival as they are expressed by their phenotype. Phenotype is the functional body of the genes made by the complex interaction of a large matrix of genes as expressed by the existing environment (Dawkins 1982, 1986, 2006). Those theories are well accepted theories within biology in particular and natural sciences in general.

Nonetheless, when sociobiology was introduced by Wilson (1980) as evolutionary analysis of social animals' behaviour, including humans, it did face highly politicized attack from many social scientists and some evolutionary biologists (see Wilson, 1976; Pinker, 1997; Platek and Shackelford, 2009; Alcock, 2001). The controversy arose in part because some evolutionary stable behaviour like rape, aggression, genocide, adultery, infanticide and so on, which are found to be naturally inherited urges, are classified as immoral 'scientific' results generated by the elite ruling class (Alcock, 2001). It also was in part because human behaviour does not seem to be consistent with those theories in all cases. For example, Alcock (2001) stated that, first, what is natural may not necessarily be moral. Fair enough. Second, he insisted that humans have moral faculty, which can enable them to restrain their immoral biological drives. However, Alcock is not able to explain how such moral restraint or the capacity to show such

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restraint can evolve in the first place. This clearly implies there is something missing in biological evolution as is understood now. Another example is Pinker (1997) who insisted that humans have different competing mental schemas, some leading towards short-term gains and others looking toward long-term goals. As a result, it is possible that restraints can come from schemes which are long-term goal oriented. This is better, but it does not explain the common occurrence of internalized morality within humanity. Humans do self-restrain, without any cost and benefit analysis, from doing what they consider is immoral, unfair, unethical and so on. That is why Pinker's approach cannot fully explain all dominant human behaviours. The question is: where do we stand now?

We have proven theories which are path breaking not only in terms of what they are able to explain within biological evolution and social evolution, but also in terms of our evolutionary understanding of human mind and human cognition (for detailed reviews of the literature, see Alcock, 2001; Pinker, 1997; Platek and Shackelford, 2009; Buss, 2005) following the ground breaking works of Wilson (1985) within sociobiology, and of Tooby & Cosmides (1987) within evolutionary psychology. However, their ideas are not only mostly ignored in wider social sciences, but also their advocates may even end up being punished through negative campaigning, low status and lack of promotion (Alcock, 2001). This is basically unscientific behaviour and the solution should be to follow the scientific method rather than trying to politicize scientific ideas. This paper will try to follow a scientific approach to show that both sides could be wrong and that the truth could be found in the middle.

In economics the problem we face is how to define human behaviour and its base of operation. The commonly used assumption, though not the only one, is to impose an egocentric rational human being with objectively defined preferences. This is sometimes called *homo-economicus*. It simplifies economic analysis by making agents' behaviour highly predictable and objective. But there is a bulk of evidence which contradicts it (see Buss, 2005). Some social scientists, on the other hand, like to assume that human goals, human reason and human morality are random social constructs (See Alcock, 2001; Pinker, 1997; Platek and Shackelford, 2009 for review). But it is impossible to show this social being, *homo-social*, emerging out of biological evolution, and there is strong evidence which contradicts it. (Alcock, 2001; Pinker, 1997; Platek and Shackelford, 2009; Buss, 2005). To overcome this gap in our understanding, this paper introduces the idea of *extended identity* and explains how it evolves following the ideas of the selfish gene and extended phenotype. The paper concludes with a consideration of the implications of *extended identity* for humanity, economics and natural sciences.

Extended identity as special case of extended phenotype

What is the problem with what we know?

The evolutionary theory of Darwin (1872), which focuses on selection based on selfish organisms, was challenged by wider observation of altruistic behaviour among organisms and especially among humans (Dawkins, 2006). In order to explain those deviations, the focus of evolutionary analysis turned toward group selections. The problem is: since group selection is evolutionarily unstable, evolution cannot possibly work at group selection level (ibid). To solve this problem Neo-Darwinians focused on gene selection, which is found to be a highly consistent and empirically strong theory when checked against non-human living things. In this case, altruism will be a function of blood relationship. Their conclusion, that the more related phenotypes are the more altruistic behaviour will be observed is not only widely proven (see Dawkins, 2006) within non-human living things, but also even within human

beings who live by forging (see Sahlins, 1972). This is well summarized by idea of selfish genes that compete for survival, as expressed by their extended phenotype (Dawkins 1982, 1986, 2006).

Moreover the game-theory-based analysis of Hamilton and Axelrod (1981) and Axelrod (1984) did show that cooperative behaviour in the form of tit-for-tat or other strategies can possibly emerge, dominate and even be evolutionarily stable against alien invaders under some conditions. The conditions for evolutionary stability are: the end of the game should be unknown; the future should not be highly discounted and the overall benefit of mutual cooperation should be very high compared to any other strategy (see Axelrod, 1984). The condition for initial development of cooperative behaviour is that either the cost of being cheated is be very low compared to the gain of cooperation or invasion has to happen at cluster level rather than at the level of a single phenotype's gene (ibid).

Based on those findings, significant behaviours of plants and animals are explained within sociobiology (see Wilson, 1980; Alcock, 2001). Moreover assuming the brain is nothing but a conditional thinker which looks for clues in the environment to choose the right action, Alcock (2001) concludes that the human brain is nothing but the same brain with more complex conditional rules. The implication is that human beings can easily be studied like other animals, using the same approaches used within sociobiology. Pinker (1997), based on accumulated work within evolutionary psychology (see Buss, 2005) and evolutionary cognitive neuron science (see Platek and Shackelford, 2009), concluded that the human brain is different. The reason given is that there are conditional rules or common sense rules which were adaptive to our hunter and gatherer ancestries as domain specific rules that are being used as built-in syntax for programming the human mind from childhood to adulthood. Those built-in syntaxes are culturally expressed and their domains within current humanity are elastic enough to generate satisfaction from arts, science, money-making and other cultural expressions (Pinker, 1997). Such argument seems plausible but may not be adequate to explain why such elasticity becomes adaptable, since in face of high competitive pressure it can cause huge fitness cost by being too elastic. That is why it can only evolve after the competitive pressure is minimized. Based on Geary (2009) the relevant time period will be 20,000 years; which is not adequate time to explain its dominance within humanity. Moreover such a theory does not allow for existence of internalized morality, where people self-restrain from doing what they think is wrong, unfair or immoral without any cost and benefit analysis.

The main problem of those theories is twofold: they failed to explain the evolution of complex morality in general and they failed to explain clearly how complex human civilization can become possible. It is clear human beings have a tendency toward suicide, genocide, infanticide, aggression, rape and so on, but human beings also have high tendency to self-restrain not only when the long-term cost is high, say prison or social sanction that can follow, as stated by Pinker (1997) but also mainly by internalized morality. Moreover, humans do give up their biological fitness to search for some superficial human goals like scientific truth, innovation, artistic expression, national pride, success of a football team and some even at cost of their fitness. In fact Pinker (1997) and Alcock (2001) did clearly claim that each is less interested about their biological fitness as a person. How such a mind-set is able to evolve is an important question, and needs a clear answer. Those facts clearly demonstrate that something is still missing from existing evolutionary theories.

The missing link we are trying to identify here is that *humans have a mind-set which can see itself not as a fixed conditional rule executer but as an end in itself*. This basically means our mind (the human mind) can define its own goals independently of biological fitness. This is self-evident to any layman, but evolutionary explanation for its existence should be given.

There is adaptive advantage to the evolution of such a mind-set once we take imperfect information and asymmetric information into consideration in the game of selfish genes. In the evolutionary game theory of neo-Darwinians, information about defection and cooperation is assumed to be conveyed without any cost. We know the mind-set works with domain specific rules or schemata or models and as a result there is always the probability of making a wrong inference. Moreover in some settings, the cost of collecting the necessary clues to make inferences could be very high resulting in less than optimal clues being collected. This could happen if the fitness cost of information is greater than the fitness benefit of that information.

But most importantly, when two phenotypes make gene-centric choice in a cooperative game with incomplete information and an imperfect model, it will make cooperation less possible. This is because information is conveyed by action that will lead to self-sustaining chaotic mutual defection. For instance, if a man suspects his wife of cheating on him, leading him to start drinking, she will become angry at him and may even start cheating on him because of emotional starvation. As a result, the man might become aggressive towards her and she may demand a divorce. It is possible she was not cheating in the first place but the husband may not have the information and he may lack the right schema to understand the information to make a correct prediction. These are concepts adapted from information economics (see Stieglitz, 2002 for review). It is clear that as the mind becomes very complex and the number of over-lapping domain-specific models become large, such problems become much worse. In other words, human beings, more than all other animals, are highly exposed to such problems in playing cooperative games. What is the solution?

Possible solution to our knowledge gap

The solution is trust complemented by prediction and sanction. By observing the behaviour of an agent for some time one develops trust that they will be trustworthy in the future. As a result the agent does not need to collect a large set of information to make cooperation with trusted agents possible. Trust will change the mind for once and for all, if avoidance of chaotic mutual defection is very important. The mind will see the trusted phenotypes and its own genes' phenotype as one social group with a unified common goal, which is also the goal of the mind. This implies that the mind has to suppress its own selfish motives and has to promote collective goals. Indirectly the mind must have its own *extended social identity* and its own goals. However in case a breach happens, one will use either personal or collective sanction to minimize the moral hazard problem. To minimize the problem of adversely selecting cheaters, one will use prediction. To minimize the problem of moral hazard, fear of sanction will be also used. This will minimize not only the information collection cost but also will minimize the occurrence of chaotic mutual defection that can happen when every phenotype is gene centric.

Reliable information about behaviour should be hard to access without high cost before and at the cooperation time, but must be cheaply available at sanction time for this process to work. For example, a retailer may not be able to assess the quality of large quantities of grain sold to him/her by wholesale traders; but the information is easily accessible when retailing the grain. By the same token, a lender may not know if a borrower is going to pay back in advance but he/she can easily observe when default happens; or in the middle of a group fight, it may be costly trying to observe who is doing what, but it will be easy to identify who was the hero and who was the free-rider after the fight is over. In essence, timing and nature of information make it costly at some points in time, but cheap at others to collect the information which make trust and sanction possible.

If prediction is highly unreliable or if sanction is less effective, trust can also be built by demanding contract specific investment. For instance, urban gangs could demand from new potential recruits the killing of a target or a complete stranger before they are admitted to the criminal community. The idea of contract specific investment for cooperation is a well-developed concept when applied to business firms by Williamson (1983). In general trust can be built by prediction or initial contract specific investment. If information to make prediction is not reliable or if the phenotype is not trustworthy or if information to make sanctions is not available or if sanction is less effective, demand for initial commitment in the form of fixed investment will be very effective in order to minimize both adverse selection and moral hazard problems. This theory will harmonize the cooperative theory of Williamson (1983) based on initial commitment with the wider theory of trust-based literature. [See Mezgebo (2009) for review of the trust and social capital literature or footnote note 1, below².]

The question we have to ask is can trust-based cooperative behaviour emerge in an environment dominated by untrustworthy people and, if so, can it be evolutionarily stable? Yes it can, and it is a well proven fact within institutional economics under some conditions. If the benefit of cooperation is very high, if the future is very important (if the future is not highly discounted), if the end of the game is unknown and if the cost of information is very high, trust-based cooperation can spontaneously evolve out of simple tit-for-tat based cooperation (see Fafchamps, 2002). Of course those game theories that are used to prove those facts are based on market analysis. But I do not think market based games are different from other biological games in terms of general framework. This is not to deny the need to check for evolutionary stability within evolutionary games, but still it is highly unlikely that under some conditions trust will fail to emerge and to be evolutionary stable. The difference between the stability checked by Fafchamps (2002) and biological evolution used by Hamilton and Axelrod (1981) and Axelrod (1984) is that the first one does not allow inter-generational analysis. In inter-generational games, strategies can pass on their success to the next generation, so that the number of phenotypes or genes in the next generation representing the strategy will be proportional to the relative success of the strategy in the preceding generation (see Axelrod, 1984).

What does this hypothesis predict regarding the nature of the human mind?

What does this tell us about the human brain, if those conditions described above are met? The implication is that human cooperation will pay if the human mind evolves in a way that can promote not only the fitness of its own genes' phenotype, but also fitness of other trusted phenotypes, as long as doing so is in the long-term interest of its own genes. Evolution-wise any organism, plant or animal, is programmed to promote the fitness of its selfish genes. This implies that promoting the survival and reproduction of the self and closely related family members is a natural urge of any living thing. Any living thing's urges and instincts are programmed to achieve immortality of the selfish gene. The genes of a person are 100% in the person and to some extent in closely related family members. This implies human beings like any other living being will show selfishness in general, complemented by altruism to others beings in proportion to their blood relation or amount of genes shared. The highest level of reciprocal and biological altruism in human beings is between parents and their off springs. Each person (say father) is supposed to see the other (off spring) as 50% of the self.

² Fafchamps and Minten, 1999a, 1999b, 2002; Fafchamps et al., 1994; Durlauf and Fafchamps, 2004; Fafchamps, 1996, 1997, 2002; Gabre-Madhin, 2001a, 2001b; Gabre-Madhin et al., 2003; World Bank, 2002; Grootaert, 1998; Overa, 2006; Lyon, 2000; Greif, 1993; Coleman, 1988; Moore, 1999; Kranton, 1996; Barr, 2000; Harbord, 2006; Palaskas and Harriss-white, 1993; McMillan and Woodruff, 1998.

Nobody will be seen as 100% of the self in biological evolution. If trust based cooperation is created, however, and if the level of trust is high, the trusted person or group will be seen as high as 100% of the self. The increase in altruism is proportional to level of trust one has in the trusted person or group. This mind-set will be kept as long as there is no breach of trust. *If trust-based cooperation is a highly superior form of cooperation and breach of trust is minimized, then in the long-run trust-based cooperation will lead to superior fitness compared to competitive cooperation or competitive defection.* Unfortunately, trust will create opportunity for “rotten apples”, which try to cheat on trusting members making trust-based cooperation unstable in the long-run. That is why the long-term fitness consequence and trustworthiness of each trusted member need to be evaluated, so as to make sure trust-based cooperation is leading to superior fitness of the selfish gene in the long-run. Since information is costly; such checks cannot be done at every moment of cooperation. However the use of prediction and sanction will ensure that the long-term fitness benefit of trust-based cooperation is superior compared to both competitive defection and competitive cooperation. What does this mean in practice?

What this implies then is that before beginning a collective fight people may select the best and bravest fighters, but once they are in middle of the fight their selfishness has to yield to collective success, meaning that they will not look at who is doing what in order to detect moral hazard, since this would not only split the mind between fight and information collection, making the cost of information very high, but could also create mutual suspicion that could lead to chaotic mutual defection. After the fight is over they can easily recollect and cross check information unintentionally collected by different group members in the middle of the fight; which can be used to allocate status and sanction between different group members. This will demand a mind-set which is more Freudian (1961) in nature but approached from evolutionary psychology and evolutionary cognitive neuron science points of view.

The mind needs to be able to define itself as essence or soul or life-goal and to define its own goal of behaviour independently of other body parts. But if the mind is nothing but complex bunches of culturally expressed common-sense and specialized schemes on a biologically made operating system and readymade syntaxes adapted to our forging ancestries, then how can it define itself? It does so by extending itself to the external world, since consciousness is nothing but mind's structured understanding of the external world and of how it works, and since the mind has to understand the world in relation to itself as well as in relation to the entire body. After all, it is the model of the external world – not what is rational and irrational, what is right and wrong, or what is moral and immoral – which defines what is common-sense. To extend consciousness to something implies two things: *first* self definition and *second* finding a goal, values and morality for one's life as they are expressed by one's cultural experiences and expressions.

Extended identity implies that the conscious mind can only define itself in relation to the stable and trusted part of the external world it encounters. In other words it is not an atomistic soul but a soul which is defined in relation to its trusted external world. This is easy to explain by asking a simple question, “who are you?” to any person . The answers will be, for example, I am Ethiopian, Christian, an economist, father of X and so on. *It does not define the self, it just shows the relation of the self to other social and environmental entities.* The self-awareness exists as a social extension of the mind. Since the self is defined by extension, the selfishness of human beings does not lead to egocentric *homo-economicus*. People will sometimes sacrifice fitness for their nation, friends, family, community, science, religion and so on. This is so because the mind is defined by its relation to those entities and as a result will promote the welfare of those entities. If a mind thinks it is Ethiopian, it will automatically have a duty to promote the welfare of Ethiopia, holding other things constant. The other of side the biological

requirement, that *extended identity* must lead to long-term fitness of the selfish gene and its cultural (and personal experience) based expression, will ensure that human beings are closely related to *homo-economicus* in the long-run. Human beings will reject any *extended identity* which is leading to inferior fitness in long-run, given their competitive environment and its demonstration effect.

If one is a supporter of Manchester United football team, the success of the club will be understood as one's personal success and its failure as one's personal failure. If one defines one's self as an American, s/he will take pride and satisfaction from successes happening in America. This leads to the us-verse-them mentality and morality whereby people can kill people from other groups without regret but not from their own group. Moreover, *extended identity* defines what is fair, what is moral, what is just and so on. This can be done partially by cultural expression of identities which give culturally defined goals. For example, what being American means and what an American is suppose to do will be programmed by culture and experience as part of the mind's model. This will supply most of the important morality of the society which not only constrains behaviour but also indirectly defines the self. Partial morality can be also programmed as a basic program in one's mind. If one is told from infancy to adulthood that to kill another person is immoral, this norm will be programmed in the mind of the person and will be part of the definition of the self at the basic level. What is important is that since the mind has high emotional attachment to itself, it will also have high emotional attachment to this morality. The result is strong internalized morality and strong social sanction for immoral behaviour, which creates a highly predictable social environment under highly imperfect information and high enforcements costs. This will make complex cooperative systems highly possible and can explain why the mind can be elastic enough to generate human organizational diversity, civilization and technology advancements.

However the extension cannot be random because in the long-run it must be evolutionarily stable at least when competitive pressure is strong. The biological evolutionary base and institutional relative functionality will limit the variations of identity which are feasible in the first place. Second, it will also demand that status associated with high fitness be allocated to those which sacrifice more fitness to attain the identity's goal. For the first case, it is clear that unless an identity can lead to stable fitness in the long-run, it will end up being corrected by natural selection. Moreover since our operating system and the different syntaxes used by different schema of the mind are adapted to the reality of our forging ancestors who operated in a highly competitive environment, the human mind will reject *extended identity* if it does not lead to higher fitness as is socially expressed taking all relevant cultures into account.

As stated above, because in early times competitive pressure was very strong and our operating system and mental syntaxes were developed at that time, our possible expression of identity was very limited. Moreover at that time it was necessary for checks and balances to be created between biological instincts and *extended identity* based mental models. This suggest the Freudian (1961) ideas of id, ego and super ego, and which are familiar enough not to require discussion. If one reinterprets the analysis of brain chemistry (Wagner, 2009), evolutionary psychology and evolutionary cognitive neuron science, from the Freudian (1961) id, ego and super ego point of view, ignoring some refuted assumptions of Freud, they are actually highly consistent with each other.

As competitive pressure is reduced and as organizations (institutions) and technologies are able to create excess fitness, beyond what is needed for biological fitness, there will be a high potential for cultural diversity. Those cultural diversities will be reflected not only in diversified cultural expression of functional biologically fit behaviours but also in the form of biologically unfit behaviours, like overweight body size which is now becoming dominant over time. But

this will not make culture random even if biological evolution stopped around 10 000 to 20 000 years ago. This is because every cultural expression will be biologically determined behaviour with high random noise added by culture. *Biology can be viewed as determining the skeleton of culture, while the rest of the flesh is randomly built (if it is random at all, which in fact may not be) following the pattern of biology to achieve functionality of different degrees.*

Since the instinct-based checks over *extended identity* needed to ensure biological fitness in the long-run are defined in a highly competitive environment, they will become less effective as civilization progresses so as to make competitive pressure insignificant. This could explain why people can even have a life goal and a way of life which do not maximize their fitness and sometimes even have a life goal and way of life that goes against their biological fitness. In addition to the minimum requirements of survival and reproduction, fitness relative to success of other communities and inequality within a community could be used to overrule culturally defined *extended identity* by instincts. This in turn will lead to reprogramming of the mind to justify the new way of looking at the world as moral, fair and just. The implication is that what is “fair reciprocity” will be culturally defined, using an alternative culture in the same competitive environment as a reference point. It also implies that those who do relatively worse than others will have a tendency to develop antisocial behaviour with internalized morality that justifies it. Such behaviour is correlated with social status, and it should have high correlation with fitness for survival and reproduction and fitness of off- springs. The final implication is that social hierarchy, inequality and cultural diversity are not the result of agriculture-based civilization, but actually predate agriculture-based civilization. The existence of social hierarchy, which is tested by existence of differential burial practices within one community by anthropologists (Haviland et al., 2008), actually is a culturally biased test to measure the occurrence of social hierarchy for all times. My informal observations of Ethiopian Muslims and Christians clearly show that the burial sites of Muslims are very homogeneous but not of those Christians. Does this mean Muslims are a homogeneous group? Or does it imply Christians are rulers and Muslims are the slaves? It is clear that the commonly used test for incidence of hierarchy is not sufficiently robust for diversified cultural expression of status, especially for time periods when competitive pressure is very high. Our next focus is to check if we have evidence for such evolution.

Possible evidence for evolutionary time period of *extended identity*

Around 4 Million Years Ago (MYA) with evolution of australopithecines, A. Afarensis (4 – 2.7 MYA), A. Africanus (3 – 2.2 MYA) and A. Aarhi (2.7 MYA), the brain parts that evolved are related to self awareness (ego), self awareness of behaviour in a social context (super ego) and capacity to make predictions (Geary, 2009). These are things we need for developing trust-based independent mind-sets. What is missing is something which could make cost and benefit analysis ineffective. But evidence for that also exists, since following the environmental change from forest to savannah, there is no visible change on the cognitive side of the mind (see Geary, 2009). When the environment changes and humans are exposed to unorthodox problems like grassland dwelling predators and serious information problems, their analytical skills to make complex cost and benefit analysis stayed more or less the same. This made their mental model less adapted to the new reality and as a result their cost of collecting information very high. What a model can do is to minimize the cost of information. If one has a good model, it can predict a lot with little information. However as the model accuracy declines, more and more information will be needed to make acceptable prediction. The lack of visible improvement on their cognitive side of mind will make information cost and the cost of chaotic mutual defection very high by making their mental model less adapted to their new reality.

In addition, bipedal limbs evolved which reduced the speed of australopithecines but also improved their temperature regulation capacity (Geary, 2009 and Haviland et al., 2008). But why bipedal evolved is not a clearly answered question in the literature (Haviland et al., 2008). Moreover the vision power of australopithecines was poorer than other primates, which could be explained by their open-land dwelling nature, since they did not need such good vision in open-land as they did in forest (Geary, 2009). I think this explains the changes that occurred in both the head and the limbs.

We know australopithecines were from 1.1 meter to 1.6 meter in height and their height increased over time (Pinker 1997 and Geary 2009). In grassland with grass 1 to 2 meter long (Geary 2009) an animal using four limbs for movement and when doing so is only 1 meter in height is invisible. Invisibility is advantageous from a safety point of view but it also has an information cost. It is not possible to watch one's sexual partner or for predators all the time so as to avoid defection and to reduce risk of attack. But the problem that australopithecines faced was not only that information was costly but also that they were not adapted to the savannah life after living in the jungle for millions of years. In other words their mental schema was not well adapted to their new environment.

Consider the nature of sexual partnership based on simple tit-for-tat without trust and how much trust could improve it. Naturally the savannah will be abundantly endowed with roots, vegetables and other vegetation that women can easily forge. The role of males would be providing protection in the form of noticing the appearance of wild predators, so as to escape to a nearby tree. The need to watch after their female partner and also to make sure the female partner is not cheating can be more effective if the male can stand on its two feet and thereby see much farther. The role of the female is to forge not only for herself but also for offspring while being under male protection. The problem she faces is collecting information about the magnitude of protection her partner is supplying and when he can chase other females. Again this can be done better when standing on two feet. Here we have a clear imperfect information problem that can be addressed either by trust or by spending more fitness on information.

To collect information about each other, they not only need to stand on two feet, thereby exposing themselves to high risk of attack, but also to be closer to each other which also increases the risk of attack. But on the other hand, the male's warning could be effective, identifying the hunter from a distance adequate to give time for the female with her off springs to escape. This created a trade-off between quantity (and quality) of information and reduction of risk. Some information has to be ignored since the cost is greater than the benefit in terms of fitness. The challenge is not only related to the problem of imperfect information but also to their less adapted mind-set in relation to their new environment.

In this setting, detection of the right motive is not only highly costly, but can also lead to the chaotic process of mutual defection. The female cannot easily predict if the male is doing his protection job well or not. In the new environment, it is not clear how to predict behaviour with less information and a less well developed mental model. The male cannot be sure if the female is having sexual relationships with other males or not. Even if she is having sexual intercourse, he cannot be sure if she is raped or not. In this environment trust can play a big role especially for the male. This is because the success rate, in terms of conception following sex, is very low and sperm competition can easily reduce the success rate close to zero by selecting more trusting and more sperm-wise competitive males. For the female once a relationship is started, assuming that the male is fit and the original contract-specific investment is put in place, trust is beneficial to the female since she has more to lose by

losing the contract. That is why trust by minimizing not only cost of information but also the chance of chaotic mutual defection can improve the outcome of cooperative behaviour.

The problem with sanction is that it is only highly effective when used by a male, since he will not be making a huge initial biological investment and cannot be certain about his fatherhood. Male defection is more effective than female defection. As a result, females will demand high initial investment as collateral in order to build trust, reducing both the adverse selection problem before selection and the moral hazard problem after selection.

In the long-run the shift to standing on two feet may have been an effective selection mechanism that differentiated the new species from others in making selection of a mate. Any tit-for-tat, with or without trust, can do better if there are clues that can improve prediction about trustworthiness. Capacity to walk or stand on two feet could provide the needed information until mutations start to happen to cheat on trust-based cooperation. Prediction will not be based completely on bipedal nature since there is the issue of initial investment and fitness selection. The advantage of trust is that, it will not demand high information content before trust is built. The female does not have to wait until the male can prove he is alpha compared to all potential mates. After a few fights she could easily make prediction about his behaviour and fitness. This is very important since spending a lot of fitness on making initial investment in the open could be costly, given that they are less adapted to the savannah life and avoiding its predators.

Trust has an advantage not only because it can reduce cost of information and can minimize cost of mutual chaotic defection but also because it will improve the survival rate of newborn infants and immature infants. In addition when the next round of mating starts they could easily use the information of the first round to avoid the first dance all together, which not only reduces information cost but also can improve long-term investment on all offspring by creating a kind of nucleolus family which sticks for an extended period of time. Those advantages can easily compensate for the increased mental processing cost that the new mind-set demands.

However, over time as mutation and deception increase, necessary clues for cheating and making cost and benefit analysis can develop. One example for such evolution is that emotional attachment in the form of deep love between two lovers tends to decline after a few years in current humanity. This is important for making cost and benefit analysis possible, so trust could be evolutionary stable. Based on hypotheses presented here, what created our mind-set is trust or, to use an emotionally loaded term, love. The first *extended identity* leads to a nucleolus family and the phenotype will promote the welfare of all members, without any cost and benefit analysis. However as the cheating mutation and the basic biological instincts override this process in some cases, necessary checks and balances will evolve over time. Four million years is not only enough to create such checks and balances but also to make it the dominant nature for all humanity. This family based *extended identity* can be slowly extended in wider dimensions to create different complex organizations in both prehistory and after. What are the implications of this hypothesis to our understanding of human evolution, economics and analysis of humanity?

Implications for economics, natural sciences and the humanities

We begin this section by considering the implications of the hypotheses of *extended identity* presented in this paper. It is arguable that the conscious human mind is an advanced prime-mate mind which can create *extended identity*. In any case it is certain that the nature of the

conscious human mind includes the capacity to create *extended identity*; and, since it must have been built in a cumulative manner, traces of it should be found in other 'smart' animals.

The existence of *extended identity* is an important foundation stone for human technological and institutional (organizational) advancement. Humans can spend years trying to develop new technology or in search of scientific truth, even at the cost of fitness. This is possible because they can extend their identities to their scientific discoveries, knowledge and/or products. Human beings can extend themselves (i.e., their identities) not only to social life, technology and arts but also to supernatural powers and entities. Moreover, since the mental program defines itself not only with regard to external social reality, but also to biological stable rules (which are elastically expressed in the form of social morality, common sense and ideas of justice and fairness that come with it for organizational purpose) it can easily use internalized morality to restrain the self from defection. Those facts will clearly reconcile evolutionary analysis with well accepted theories of conventional psychology and humanity. Now let us turn toward institutional and organizational analysis.

Trust is basic to any organization. Trust could be micro-based, built through personal life experience; it could also be defined at the meso level and based on statistical discrimination; or it could be macro in nature and based on trust in an organizational system (Dore, 1983, Fafchamps, 2002). As cost of information declines and as benefits of cooperation become less dominant in relation to cost of being deceived, the role of trust will decline and other methods of organizational and institutional structure will develop to make cooperation possible. In all organizations some level of trust is involved because any contract is always incomplete and any formal law or informal norm is always vaguely defined to allow flexibility (Klein et al., 1978). Fortunately, trust opened a new dimension of evolution that is organizational (institutional) and technological in nature. With some redefinition of production technology as software, we can present the idea in terms of the evolution of institutions. The intuition of the author is that evolution of institutions that is organizational and technological in nature is actually happening within humanity. Once we approach it from this angle, we could say it is cultural evolution; but what are evolving are specific institutions not cultures in general. As biological evolution implies evolution of selfish and fit genes, cultural evolution could imply evolution of selfish and fit institutions.

Humans are selfish by nature, as is *homo-economicus*. What is changed is the conception of the self. Society can define not only the social expression of the self but also the nature of competition for social status and associated allocation of fitness. If society defines money-making as an important goal of life, people will compete to make money. If society defines the goal of life to be serving a supernatural power, people will compete in their service for that supernatural power. Those expressions are not random because their "skeleton" is defined by the biological base of the mind. Nonetheless, culture with experience has freedom to modify its form just as flesh can modify body parts without seriously biasing their skeleton foundation. However this does not mean the self is meaningless and that what matters is the collective identity (*homo-social*). Social conditioning is not the creation of homogenous beings under controlled experiment. Human beings will have diversity in both inherited biological hardware and their expression based on cultural and personal experience. Those facts will make humans close to *homo-economicus* in most of their day-to-day life, in terms of selfishness. However because conforming to the morality and ethics defined by one's culture and experience is likely to be in one's self-interest, real-world *homo-economicus* is also likely to have a moral and ethical dimension. It is logical that in small isolated communities individuality will be weak and in large and diversified populations individuality will be highly manifested. This is because in a large population there will be a high diversity in the conditioning environment. Moreover if organizational efficiency is at a lower level, it can also

allow for more individuality. If every family and person is independent, in its day-to-day fitness competition, higher individuality will be observed. A higher similarity of the conditioning environment will also create a more uniform mind-set among people living in such a community.

The hypotheses of *extended identity* proposed in this paper may be right or wrong, but there is no doubt that biological evolution by itself cannot explain much of human behaviour as it stands. We need to allow for cultural and institutional expression of biological adaptation and their variation, if we are going to understand human behaviour and human nature and, most especially, in the economic context.

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