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To cite this version:

Clement Allan Tisdell, Serge Svizzero. The Malthusian Trap and Development in Pre-Industrial Societies: A View Differing from the Standard One. 2015. hal-02152050

HAL Id: hal-02152050

https://hal.univ-reunion.fr/hal-02152050v1

Preprint submitted on 11 Jun 2019

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ISSN: 1442-8563
WORKING PAPERS ON
SOCIAL ECONOMICS, POLICY AND DEVELOPMENT

Working Paper No. 59

The Malthusian Trap and Development in Pre-Industrial Societies: A View Differing from the Standard One

by

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January

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Chief Investigator: C.A. Tisdell and Partner Investigators: Associate Professor K.C. Roy and Associate Professor S. Harrison. However this series will also provide an outlet for papers on related topics. Views expressed in these working papers are those of their authors and not necessarily of any of the organisations associated with the Project. They should not be reproduced in whole or in part without the written permission of the Project Leader. It is planned to publish contributions to this series over the next few years.

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The Malthusian Trap and Development in Pre-Industrial Societies: A View Differing from the Standard One

ABSTRACT

Presents a simple economic theory explaining how some agriculturally based preindustrial societies (for example, in the Neolithic period) developed despite most of their population being subject to Malthusian dynamics. Their development depended on a dominant class (limited in size) extracting the economic surplus which could be used (among other things) to accumulate capital and advance knowledge and thereby, add to this surplus. Cities facilitated this process. Extraction of the surplus prevented increased population from dissipating it and curtailing development. Several early extractive and non-inclusive societies were long lasting. This is at odds with the theories of some contemporary development economists.

Keywords: Institutional economics, Malthusian trap, Neolithic development, population dynamics, social inequality and development

JEL Codes: O1, P4, N00

The Malthusian Trap and Development in Pre-Industrial Societies: A View Differing from the Standard One

1. Introduction

It is generally recognised that two major economic revolutions resulted in substantial increases in the global population of human beings. These were the commencement of agriculture in the Neolithic period which subsequently was able to support significant urban settlements and much later, the Industrial Revolution (Childe, 1936 [1965], 1950). In fact, the development of urban settlements reliant on agriculture is seen by many writers as heralding the commencement of civilisation and as being the basis for subsequent intellectual and cultural advances by humankind. In addition, in many pre-industrial societies, significant economic innovations occurred and major public works were completed. It is unlikely that this type of economic progress would have been achieved if the whole of the population was subject to Malthus' theory of population dynamics. How then can development in pre-industrial economic societies be explained? The purpose of this article is to present a simple theory of how this was possible.

Several influential economists (for example, Clark, 2007) have recently provided support for Malthus' theory of population dynamics. Clark (2007, p. 1) states that before 1800, there was no upward trend in income per person and that because of the Malthusian trap, short-term gains in income as a result of technological advances were inevitably lost due to population growth. While this seems to have been true for the masses, because of the mechanisms outlined in this article, it did not prevent continuing technological progress and capital accumulation (features of economic development) in some preindustrial societies. Furthermore, Ashraf and Galor (2011) paint a dismal picture of preindustrial societies and provide statistics which indicate that the average per capita level of income in these societies remained at subsistence level, despite the occurrence of some technological progress. Galor (2005) and Ashraf and Galor (2011) elaborate on the well-known view that the Industrial Revolution represents a great divide in the process of economic development. Not only did it eventually result in demographic transition but it was also associated with increased equality of income.

Galor (2005) contends that inequality of income was a significant impediment to economic

development in agrarian societies. Moreover, Galor et al. (2009), also express this view in relation to more recent historical events. Contrary to this view, we contend that income inequality was essential (but not sufficient) for economic development in preindustrial societies.

Many scholars assume, as Galor (2005) did, that the thesis that inequality promoted accumulation and economic growth is not supported by historical evidence. They consider that substantial economic inequality has always been correlated with extreme concentration of political power, and that power has always been used to widen income gaps through rent seeking and rent keeping, forces that can demonstrably retard economic growth. However, we argue that this thesis needs modification.

Furthermore, the thesis that the bulk of the population in agrarian societies lived at subsistence level has not gone unquestioned. See for example Maddison (2007). However, in developing the following theory, it is accepted that the bulk of the population in agrarian societies was subject to Malthusian like population dynamics and lived approximately at subsistence level.

We argue that some such societies were able to achieve significant investment in capital works and the advancement of knowledge because a large proportion of the economic surplus was appropriated by a relatively small dominant class and that the size of the population of this class was constrained. The appropriation of the economic surplus produced by the dominated class, limited the growth or the size of their population. Otherwise, the growth in the population of the dominated class would have completely dissipated the potential available economic surplus, given the Malthusian theory of population growth. This view is consistent with that expressed by Brenner (1976).

This article is set out as follows. First the theory of the extraction of the economic surplus and its consequences for population growth and development are outlined. Then it is shown how, given this extraction, the dominant class could gain from capital accumulation and support for knowledge creation. Factors that helped to limit the size of the dominant class are subsequently considered and paying particular attention to the urban revolution, a general discussion of social inequality and development in preindustrial agrarian societies follows.

2. Demographic and Economic Consequences of the Extraction of the Economic Surplus by the Dominant Class

Extraction of the economic surplus in agrarian societies by the dominant class provided the means for capital accumulation (including additions to human capital), for their defence and for consumption by the elite. The long run fate of such societies was influenced by the balance it was able to achieve between the potential uses of the economic surplus. Defence expenditure and extravagant consumption by the elite would reduce the surplus available for capital accumulation. In some cases, some agrarian societies may have been in the unfortunate position having to allocate most of their economic surplus to defence in order to survive, and even then, some may have been unable to prevent foreign invasion. In any case, it is clear that the dominant class had a strong economic interest in appropriating the economic surplus generated by the dominated.

The simple type of economic relationships involved can be illustrated by Figure 1.[1]In this model, the level of the agricultural output Y, of a society is assumed to depend on the level of the population of the dominated class, X. Given the existing technology and capital, the marginal productivity of the dominated class is indicated by line ADE and line ABC as its average productivity. Assume that the subsistence level of income is OS per head. Then in the absence of any appropriation of the surplus by the dominating class, the equilibrium population of the dominated will be X_3, given Malthus' theory. The economic surplus is entirely dissipated in this case. Suppose, however, that the dominant class imposes a levy of ST per head on the dominated. The equilibrium level of population of the dominated class is now X_1(this is much smaller than if an egalitarian system of distributing output existed) and an economic surplus equivalent to the area of the hatched rectangle SDVT is appropriated. Total agricultural output is equal to the area of rectangle OLVT.

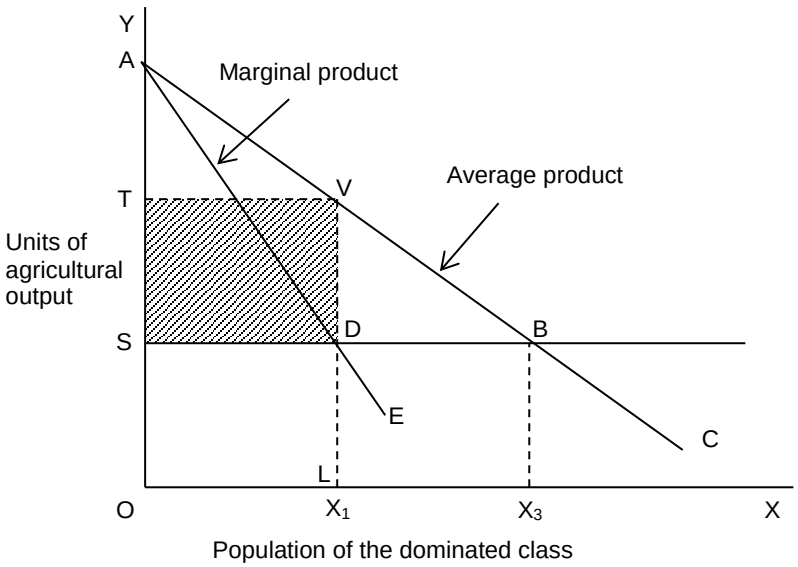

Figure 1: An illustration that the dominant class by appropriating the economic surplus generated by the dominated class prevents the dissipation of this surplus.

Note that we do not specify the dynamics by which the dominated population adjusts its level of population in relation to the availability of income. Stability, however, requires that not all members of this population be equally vulnerable to a reduction in income of this population when all are already at subsistence level (Tisdell, 2013, pp. 141-150). In practice, members of this population could have differences in their ability to access income when it becomes scarcer or may vary in their fitness, that is their ability to temporarily survive food deprivation. In their dynamic model, Ashraf and Galor (2011) make variations in the numbers of surviving children the adjustment variable. However, adjustment mechanisms to the population (if it decreases) could also include the death of less fit (such as the elderly) and those who have been excluded by 'stronger' persons from adequate access to food in times of shortage.

The development of agrarian societies depends, as was mentioned above, on the use which the dominating class makes of the appropriated economic surplus. After meeting its military requirements and satisfying its consumption, the remaining sum can be invested by the ruling class to increase the amount of the surplus the ruling class can appropriate in the future. This is assuming that its investments are productive.

Milanovic et al. (2007) provide some empirical evidence of the magnitude of the extraction ratio in some preindustrial societies. They infer the extent of economic inequality for 14 preindustrial societies, stretching from the Roman Empire 14 AD, to the Byzantium in 1000, to England in 1688, to Nueva España around 1790, to China in 1880 and to British India in 1947. One of their results(2007, p. 28) is that the *extraction ratio* – how much of potential inequality was converted into actual inequality – was significantly higher in preindustrial times than now. The ratio shows how powerful and extortionary were the elite, its institutions, and its policies. However, their paper focuses on measuring inequality in preindustrial societies, and does not explore the social structure underpinning inequality nor its determinants.

3. The Incentive of the Dominant Class to Undertake Investment

The scope which the dominant class has to increase its economic surplus is illustrated by the example in Figure 2. As before, OS is the subsistence level of income of the dominated class and the line marked ADE shows its initial marginal productivity relationship. As a result of investing some of its economic surplus, the dominant class is assumed to increase the marginal productivity of the dominated group. This may result in the marginal productivity relationship moving up to the line HJK. The maximum economic surplus available to the dominant class now increases by an amount equivalent to the dotted trapezium ADJH. Originally, this surplus was equivalent to the hatched area shown. If the maximum amount of economic surplus is appropriated by the dominant class, the population of the dominated group increases from X_1 to X_2 following investment from the economic surplus. However, the level of income of the dominated remains at the subsistence level. They gain no economic advantage. The only group that has an economic gain is the dominant class. Total agricultural output rises from an area equivalent to the area of quadrilateral OLDA to that equivalent to the area of quadrilateral OMJH.

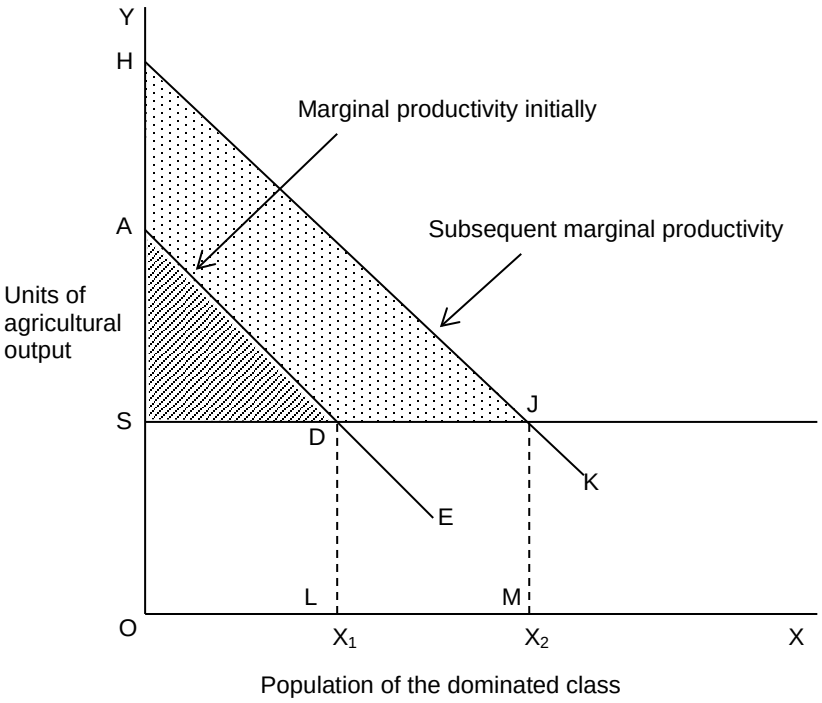

Figure 2: A case in which investment of at least some of the economic surplus adds to the economic surplus and results in an increased population of the dominated group.

The dominant class is unlikely to know the exact amount it should levy on the dominated to appropriate the maximum amount of the economic surplus. Nevertheless, even if it only approximates this levy, the same general consequences follow.

Note that the above theory seems to be at odds with Childe's (1936 [1965], pp. 230-231) assertion that the rulers who emerged after the urban revolution had few incentives to encourage invention. He bases this thesis on the view that these rulers 'now commended almost unlimited reserves of labour recruited from subjects fired with superstitious faith and captives taken in war; they had no need to bother about labour saving inventions' (Childe, 1936 [1965], p. 231). However, as the above theory demonstrates, these rulers could gain substantially by increasing the productivity of labour. Nevertheless, in some cases, they may not have chosen to do this or they may have been too constrained by necessary expenditure in defence to have funds left to do this.

It might be contended that the example given in Figure 2 does not adequately take account of

Childe's viewpoint because the result of the productivity increase depicted is to increase the demand for labour. However, suppose that the marginal productivity curve of labour after a productivity enhancing event is much steeper than illustrated but starts at point H and passes through a point near the left hand side of D. The total demand for labour declines in this case but the economic surplus rises. If all the ruling class wants to do is to raise its economic surplus, it would not be concerned by whether this increases or decreases the employment and population of the dominated class.

4. Mechanisms Limiting the Size of the Ruling Class

The above theory depends on the size of the population of the ruling class not being determined by the population principle of Malthus but on its being limited. In fact, if this class were to increase in proportion to its means of subsistence, it would have no surplus left to retain its dominance. Its position in all probability would be usurped by outsiders. The mechanisms which are limiting the size of the ruling class can be either endogenously decided by the elite (for example, the principle of primogeniture or forced exclusion) or can be the result of exogenous events (for example, as the result of invasions, or internal conflict and warfare).The size of the dominant class was also limited on occasions by rivalry among its members and by usurpers.

Furthermore, following the conquest of a society by a foreign power, the conquerors mostly replaced the pre-existing dominant class by their own which in many cases, was smaller in number. This happened, for example, several times in the case of China. In northern and central China, the Western Chou, who had been powerful in the Shaanxi province (along the upper Wei River) as the western neighbours of the Shang, defeated the Shang and dominated the region from 1122 to 771 BC. In the Common Era, for example, Kublai Khan following the successful invasion of China by the Mongols established the Yuan Dynasty (1279-1368) with his Mongol followers as the ruling class in China. Similarly, the invading Manchus established the Qing Dynasty in China (1644-1912).

It was not only by invaders that the size of the ruling class could be reduced from time to time by other means also, including internal rebellion. One such process has been described by Gascoigne in relation to China as follows:

'A new dynasty begins with a clean slate. It has few commitments, and its prestige or strength

is sufficient for it to gather more than adequate funds for its immediate needs. With the passage of time the imperial family grows larger and greedier, the official classes become used to luxury and, being themselves the bureaucrats, tend to shift the tax burdens from their own shoulders onto someone else's (in later dynasties the mandarin class was officially exempt from tax). Ever increasing demands fall, ultimately, on the one group of people without influence, the peasants. When the system has deteriorated so far as to be intolerable, the peasants finally rise in rebellion.' (Gascoigne, 2004, p. 70)

However, these revolts often enabled other members of the elite to overthrow the top echelons of the ruling class. This happened on several occasions during the period of the Han Dynasty (206 BC – AD 220) in China. On one occasion, the very generals charged with putting an end to a peasant rebellion took advantage of the situation to establish themselves as the rulers (Gascoigne, 2004, p. 72).

5. Discussion of the Above Development Theory

Opinions differ about whether the type of social inequality which developed after the commencement of agriculture in the Neolithic period and which continued (with variations) until after the Industrial Revolution, retarded or promoted economic development. Galor (2005) argues that such inequality was unfavourable to economic development. However, that view depends on how one judges the presence or absence of development. If it is judged by increases in the per capita income of the bulk of the population and the extent of their freedom, one could conclude that no development occurred. However, if one considers the extent of advances in knowledge, improvements in production technologies, in the organisation of societies, the extension of economic exchange and the provision of infrastructure during this long preindustrial period, one cannot fail but to be impressed by the amount of development of human civilisation which occurred. It is doubtful whether an egalitarian system (even if it could have survived given the structural change brought about by the development of agriculture) would have been able to achieve similar results. In fact, given Malthus' theory of population dynamics, the above theory demonstrates the impossibility of economic development. It is possible that in hunter gatherer societies, the Malthusian theory of population growth did not hold because of the presence of social and practical limitations on size of families. However, these constraints disappeared in agrarian societies (Childe, 1936 [1965]). What is more likely to have happened is that income

inequality must have risen as hunter gathers slowly evolved into ancient agricultural settlements with surpluses above subsistence[2]. Inequality rose further as economic development in these early agricultural settlements gave the elite the opportunity to harvest those rising surpluses.

The above theory only shows that a potential existed for development given the type of social inequality present in many agrarian societies for several millennia. In some such societies, this economic surplus was harnessed for economic development but not in all, either by choice of the rulers and by their need to use their surplus to stave off external aggression. Furthermore, the size of the economic surplus available for development may have varied historically in agrarian preindustrial societies. With the passage of time, the social system may have become ossified and bogged down in armed conflict and burdened by superstitions and social rules of conduct, thereby retarding the scope for further progress.

Childe (1936 [1965], Chapter 9) argues that this was the case. In Chapter 6 (1936 [1965]), Childe describes how the priestly class and the rulers of early agrarian societies (such as that of Sumer and Egypt) promoted capital accumulation and in Chapter 7, he specifies the way in which knowledge increased in such increasingly urbanised societies. He attributes increased knowledge as largely a response to the challenges of administering societies which had increased in their economic interdependence and in the scale of their economic activities.

Childe states that

‘the divine pharaoh [of early Egypt] did not earn obedience by conferring on his subjects only fictitious blessings. His authority was consolidated by tangible economic benefits conferred upon his kingdom. Like the unsubstantial duties of Mesopotamia, this substantial god divested part of his power and wealth to the material prosperity of his kingdom, a share of his resources was invested in genuinely reproductive undertakings. A pharaoh of Dynasty II is represented ‘cutting the first rod’ of a new irrigation canal. Operation instituted by the king for the control of flood waters are mentioned.’ (Childe, 1936 [1965], pp. 159-160)

Childe continued to produce further examples such as the advance in knowledge motivated by administrative ends and the role of rulers in promoting foreign trade.

In Chapter 9, however, Childe (1936 [1965]) provides a rather different perspective which (to some extent) is at odds with his exposition in Chapter 7. He claims that in the two millennia

preceding 3000 BC, many important discoveries were made (in the often claimed cradle of Western civilisation in West Asia and the Mediterranean region) which contributed to human advancement, but from about 2600 to 600 BC, 'few contributions of comparable importance for human progress were made.'

The urban revolution (which evolved in those parts of the globe where suitable developments in agriculture occurred and which, as pointed out by Childe (1950) was facilitated by complementary circumstances) amplified class division in agrarian economies. Somewhat contrary to his position outlined in Chapter 6, Childe argues in Chapter 9 that this increased class division retarded economic progress (Childe, 1936 [1965]). He claims that the bulk of productive inventions prior to the urban revolution were made by actual producers. After the urban revolution, actual producers were relegated to the dominated class, and they could not escape from the lower class by technical improvement 'that the ruling class could hardly appreciate'. Their best hope was to join the middle class in supporting 'the established church' (Childe, 1936 [1965], p. 231). This was a recipe for the retardation of the progress of mankind. He concludes: 'Thus, from the point of view of progress, Egyptian and Babylonian societies were involved by the urban revolution in a hopeless contradiction. And they bequeathed the contradiction to various successor states – Hittites, Assyrians, Persians, Macedonians – that took them as models' (Childe, 1936 [1965], p. 231).

One is left with a quandary. Is the positive view given in Chapter 6 of Childe (1936 [1965])about the role of the urban revolution in fostering development more accurate than his negative version in Chapter 9 of the consequences of this revolution for human progress?[3] Adding to this confusion, Childe (1950) provides an insightful analysis of the conditions required for the development of urban centres and portrays their positive contributions to development. In any case, it is not true that all societies showed lack of economic development following their increased urbanisation. For example, early Chinese societies continued to develop even though before the end of the Qing Dynasty, signs of economic stagnation were apparent. Furthermore, in the West, the administrative structures of nation states experienced substantial change. Many nation states disintegrated into localised fiefdoms. In Europe this disintegration was prevalent in the Medieval period and much of Europe's infrastructure (such as roads and bridges) fell into a serious state of disrepair (Bloch, 1962, Ch. 4). Strong divisive forces developed which retarded economic progress. Nevertheless, not all accumulated knowledge and wealth was lost in this period, and the

economic functions of the urban based middle class expanded (Bloch, 1962, Ch. 4) and eventually would provide a springboard for the commencement of the Industrial Revolution.

6. The Pivotal Role of Urban Centres in Development: Illustrations and Analysis

The above theory of the appropriation of the agricultural surplus by a ruling elite needs to be extended by relating it specifically to the development of urban centres (cities). The mere fact that agriculture eventually was able to yield a food surplus did not in itself support the development of civilisations. It was necessary for the ruling elite to be able to marshal this surplus and transport it to central places, namely cities (Smith, 2003). This required the surplus to be sizeable in total, easily transportable, and storable. Grains (such as wheat, rice, millet, maize and the seeds of some legumes) were suited to this purpose. It is therefore, not surprising that early civilisations with important cities developed in areas where these commodities were available, for example, in Mesopotamia, Egypt, China, India and parts of the Americas. Such commodities were able to support cities and provided the dominant class with a surplus which it could allocate to various uses, such as capital accumulation, defence and the waging of war, its own consumption and knowledge accumulation and transmission.

The scope which early societies had for benefitting from agriculture depended significantly on their available initial resource endowments, for example, the availability of wild species suitable for domestication, their climatic conditions, the scope for navigation and the ease of transport of produce (Diamond, 1997, Ch. 5). Localities close to the sea or rivers were at an advantage in early times because it was usually least costly and quicker to transport produce by boat than by land.

Even when agriculture developed in very early times, this did not always result in the development of cities nor significant social stratification. For example, it is believed that agriculture developed in New Guinea around 7,000 BCE (Renfrew, 2007, p. 210) but no major cities developed there and Melanesian societies appear not to have become socially stratified. This could be due to a combination of factors. Agriculture in New Guinea did not produce grains but mostly tubers and bananas (plantains) both of which are more perishable than grains. Transport (because of the terrain) was also an obstacle and probably the food surplus produced by each household was not large. This situation was not favourable to the development of the type of stratified societies containing cities which developed in Eurasia, North Africa and parts of the Americas.

In prehistory and early history, it is likely that both resource endowments and institutions were important for development but to some extent, because resource endowments influenced the nature of agricultural commodities produced, this determined the nature of the social institutions which evolved, for example, whether or not a society was socially stratified. In recent times, many economists for example, following North (1990) and North and Thomas (1976) have portrayed institutional structures as being of greater importance as an influence on economic development than resource endowments. In fact, the influential economists D. Acemoglu and J. Robinson state that:

'Political and economic institutions, which are ultimately the choice of society, can be inclusive and encourage economic growth. Or they can be extractive and become impediments to economic growth. Nations fail when they have extractive economic institutions supported by extractive political institutions that impede and even block economic growth.' (Acemoglu and Robinson, 2012, p. 97)

While this statement might be correct, one ought to be sceptical about it. First, it is not clear how much choice societies have about their institutions. To a considerable extent, they may be determined by evolutionary forces over which individual societies have little control. Secondly, historical evidence also indicates that nations do not always fail quickly when they have extractive institutions. For example, Sumerian civilisation lasted for more than 1,500 years, that of ancient Egypt for over 2,000 years and arguably, that of China also for over two millennia, and many other early civilisations including that of the Romans, those of the Mayans and the Incas lasted for several hundreds of years (Haywood, 2010). Whether or not any of today's nations having more inclusive societies will last for several millennia is not at all clear.

Urban centres (cities) played a significant role in the development of preindustrial societies which relied on extractive institutions for their development. Cities were crucial in the development process because they allowed wealth and power, to be amassed and they enabled the rapid exchange of ideas among relatively large numbers of people, thereby encouraging intellectual thought and artistic expression. Cities also promoted specialisation in manufacturing and trade and fostered the emergence of centres of political power (Baker, *et al.*, 2010). In cities, as settlements grew so large that not everyone knew each other, residents could no longer rely on family and village leaders to settle disputes or to decide issues for the whole community. Large societies hence developed governments, often starting with a single

strong leader who, as the need arose, empowered others to assist him. Over time the result was the introduction of a government and its associated administration, that is, an array of officials who carried out decisions, maintained order, organised food reserves, supervised construction projects, and resolved conflicts among strangers. A government's main functions were to secure the society's sustenance, ensure the survival of its ruling elite, and defend against outsiders. The connection between Bronze Age urbanisation and the political development of states and emergence of ruling elites is supported by considerable evidence. Urbanisation is connected with the development of new crafts and craft skills (for example, metallurgy), that is, with specialisation, and also with institutions that coordinated multiple production activities and infrastructure. This is why, since Gordon Childe (1936), scholars have used the term 'Urban Revolution' for this transformation.

Urbanisation, Labour Specialisation and Coordination

Even in ancient history societies, urbanisation changed the nature and the consequences of settlement. The city is not just a denser and larger settlement than the villages that support it with food and fuel. It is also a social entity where people are linked together not by the ties of kinship as in tribal society, but by interdependence and functional complementarity. Although towns and cities depended on farming, their most influential inhabitants were those who did not farm (Wailes, 1996). With their food supplied by farmers, these people could specialise in other occupations. Indeed, city life and clustering makes sense only when there are several persons engaged in diverse non-food producing occupations such as metallurgy, stone carving, administration, serving the temples, and trade. Producers of non-subsistence goods were largely dependants of the rulers or temples. The more specialisation there was, the more the individual depended on supra household organisation mechanisms and less on face to face community ties. Instead of being a total of so many tribes and clans, the city was a population held together by regulation and coordination. The elite ensured not only law and order, but the administrative structure on which the division of labour could be organised. The ruling elite demanded the labour of the urban populace, if not token tribute as well. An overarching administrative and regulatory structure such as this ran on systems of recording (writing) and calendar keeping. This is why there is a logical connection between the coming of cities and the existence of states or societies ruled by elites.

Metallurgy

The development of metallurgy marks a shift from simple to advanced agrarian societies and it highlights the role of the elite in economic development. Even if metallurgy appeared during the Neolithic period, the Bronze Age represents a true leap forward in technology of metal work, and therefore of other crafts using metal tools. Most important is a point emphasised by Gordon Childe: these items were produced for the urban elite rather than the populace. Metallurgy came into its own when specialists produced objects for royal ancestor rituals as in China, or tools for urban workshops of the Mesopotamian temple and palace establishments, or for mortuary cults as in Egypt. Not only were such institutions a source of sustained demand, but the infrastructure, such as fuel, raw material and the day to day needs of metallurgists, could be provided. The social context of such technological development was the emerging division of labour and specialisation, and also demand from ruling elites and their productive establishments. Hence, the implications of metallurgy were fully realised only with the coming of states and/or cities.

Infrastructure

Urbanism is possible only when the land has a capacity to support a large number of people per unit area: for it entails the clustering of people in dense settlements, rather than an even dispersal across the landscape. Also necessary are technologies that make feasible the transport of bulky food grain to the non-farming populations of urban nodes. In ancient history, infrastructure consisted mainly of roads (Lay, 1992) and canals, the latter were used for transportation or for irrigation(Rodda and Ubertini, 2004). The first paved streets appear to have been built in Ur in 4000 BC. In 500 BCE, Darius I the Great started an extensive road system in Persia while, as it is well known, Romans built an extensive road system with the rise of the Roman Empire.

It has long been noted that early cities and states all arose in river valleys in semiarid regions[4]. Thus it can be held that such environments prompted the formation of states, since the latter were probably created to organise vast numbers of people to build banks and dikes for flood control and irrigation systems to bring river water to farm fields. The oldest known canals were built in Mesopotamia 4000 BC. In Egypt, canals date back to at least 2300 BC, when a canal was built to bypass the cataract on the Nile near Aswan. In ancient China, large canals for river transport were established as far back as the Warring States (481-221 BC). By far the

longest canal was the grand canal of China completed in 609 CE, still the longest canal in the world today at 1,794 kilometres.

A few advanced cities had aqueducts that serviced public fountains and baths. There is also the evidence that Harappan urban centres provided a street drainage system and other civic infrastructures. Street drainage functions only as a planned whole. Individual households cannot organise it piecemeal and therefore, this system appears to have been the outcome of elite regulation and coordination.

Trade

There is a marked correlation between the period of state emergence and an expansion of trade, in Egypt, Sumer, and South Asia. This trade expansion is, to a large extent, explained by activity undertaken by the elite. In addition to special privileges over land, water sources, mines, or pastures, the members of the elite assumed a sacral role, distinguishing themselves from the rest of the populace by ostentatious consumption (of metal work, exotic stone beads, shell carvings, etc.) and feigned mysterious powers. Thus, there were imperatives to organise the imports of high status cum utilitarian things. It also appears that the procurement of metals and semiprecious stones from afar for the elite created a need for ever larger quantities of them. During the Bronze Age and from the elite's point of view, the development of centres of civilisation generated in them the need to acquire their own bronze weaponry to defend themselves or to organise the mass casting of weapons for military expeditions and conquests. We may probably claim that the more successful a ruler was in procuring copper and the alloying metals, the more military success he would have. Therefore, economies utilising bronze tools of production and bronze weapons were doomed to be dependent on elite organisation of external trade (especially to obtain tin which was very scarce) and local production.

Nevertheless, it should not be concluded that trade in preindustrial societies was only for the purpose of providing prestige products for the ruling class and metals for war and defence (Chapman, 2008). For example, the economy of the Inca Empire (1000-1533 CE) relied on trade between different climatic zones of the Andes to stabilise its food supplies and its rulers built an extensive road system to facilitate this trade. They also developed irrigation in some of its arid areas. According to Haywood (2010, p.211), 'the products of the different environmental zones were exchanged vertically between communities' and this 'provided

considerable insurance against the failure of any individual crop'. The Inca rulers also constructed large storehouses of food to be drawn on in times of need.

In the Old World, it is possible that with the development of the Iron Age, the ruling elites concentrated more on waging war to fill their coffers and less on increasing domestic production and expanding peaceful external trade to extract a greater amount of economic surplus. To an increasing extent, they lived off their subject populations, acquiring booty, enslaved labour, captive artisans, and relied on regular flows of tribute. This undoubtedly retarded economic development.

Defence and Conquest

By 7000 BCE, as food supplies increased, some West Asian settlements grew quite large. Jericho in Palestine and Çatal Hüyük in what is now Turkey, for example, developed into towns - large settlements, housing several thousand people that served not only as residential centres but also as trading hubs. By the fourth millennium BCE, near the Tigris and Euphrates rivers in West Asia and the Nile in northeast Africa, some towns grew into cities. These were very large, complex, densely populated settlements in which many people engaged in occupations other than farming. At these sites, excavations reflect the emergence of organised religion and give the impression that rulers exercised great power. Fortifications and weapons found in early cities suggest that they must have had numerous labourers to build the walls and watchtowers, soldiers to defend against outsiders, and governing officials with the authority to organise and supervise large groups of workers and warriors (Gat, 2006, pp. 167-173).

From around 1800 BCE onwards, a new type of state, which may loosely be referred to as an empire, began to emerge, initially in West Asia[5]. As a type of state the empire encompassed a fairly large territory which was not confined to a given geographical zone. It was usually, though not always, monarchical; had extensive military resources and was based on the collection of a large amount of tribute. Every empire had a core area as its political centre, and the ruling class of the empire belonged overwhelmingly to this core area. It was through conquest that the ruling elite of an area could establish its domination over other areas. The sheer logic of empire building necessitated the mobilisation of a large well trained army and resources to sustain such an army. Thus empire building, appropriation of large surpluses in the form of tribute, and maintaining huge armies were all closely interlinked.

Knowledge Accumulation and Transmission

Knowledge is partly conceived as the increasing capacity of an individual, a group, or a society to solve problems and to mentally anticipate the necessary actions. Knowledge was in early societies particularly tied to the management of the economy. Hyman and Renn point out:

'Sociocultural evolution inherently involves knowledge that is efficacious, either with respect to the physical world or with respect to the social world. […] this knowledge economy was almost completely tied to the underlying economy of labor. For example, literacy was closely correlated with socioeconomic status, and in Babylonia astronomical knowledge was pursued for agricultural and legitimatory ends, so that the pursuit of astronomical knowledge was ultimately motivated by economic concerns'. (Hyman and Renn, 2012, p. 95)

In early societies, a priestly class was supported by the elite and in part was responsible for the advancement of knowledge. Beyond the creation of knowledge, it is also necessary to consider knowledge as something that may be shared by members of a profession, a social class, a geographic region or even an entire civilisation. Shared knowledge is especially important to the artistic, religious, legal and economic systems that constitute cultures; and knowledge travels along with artefacts and artistic styles, myths and rituals, laws and norms, goods and wealth. This distribution is facilitated by external representations of knowledge such as spoken language, writing and technological artefacts. Spoken language[6] has always constituted one of the chief means of transmitting knowledge, and language spreads with migration, conquest and trade.

However, the invention of writing[7] created a new and powerful tool for the transmission of knowledge since it enabled knowledge to travel, in both time and space, beyond the immediacy of the speech situation. The invention of writing in Mesopotamia was originally a consequence of state administration. With writing came metrologies, calculation techniques, and finally, the rise of the first sciences, which may thus be conceived as resulting from a reflection on the social processes of organising labour. Trade and the exchange of goods on a larger scale were also developed, accompanied by written contracts, agreements and systematic and regulated forms of communication, also developing into multilingual formats. Mathematics emerged in ancient Babylonia when the material means of organising human labour, such as accounting systems, became an object of intellectual exploration.

Religion was one of the most important conveyors of the globalisation of knowledge and of science in the period between antiquity and the early modern era. It has often been argued that knowledge travelled with rituals (and associated verbal recitations), specific geometrical and knowledge needed to construct ritual altars was transmitted. It is also true that in many agrarian societies, impressive temples, shrines and mausoleums were built. While these might not have been productive, they may have played an important part in the social cohesion of these early societies and their construction would have helped advance building skills.

The accumulation and transmission of knowledge were largely contingent on the emergence of a social network that supported the production and dissemination of knowledge. Hubs in this network were typically flourishing trade or religious centres, or capital cities of large empires. Empires further facilitated the wide range diffusion of knowledge and, in particular, the integration of knowledge emerging from different hubs.

An Observation from the Above

In places in preindustrial societies where agriculture developed and had attributes that enabled it to support the growth of cities, this increased the power of the dominant class if it already existed or enabled it to emerge and become powerful. Cities facilitated the ability of this class to accumulate wealth by appropriating the agricultural surplus and as demonstrated, cities played (by varied means) an important role in adding to wealth and fostering development. Despite Childe's (Childe, 1936) ambivalence about the role of cities in development, in the absence of cities, it seems likely that development of civilisations would have been much slower in preindustrial extractive societies than was in fact the case. Even though these societies were extractive and non-inclusive, many lasted for hundreds of years and did add to wealth, a result which seems to be a variance with the prediction of Acemoglu and Robinson (2012, p. 97) that such societies are doomed to fail quickly.

7. Concluding Comments

It seems that many ancient agrarian societies faced an economic and social dilemma. If they became egalitarian, the increased economic surplus which the development of agriculture and urban settlements eventually made possible would have been frittered away by population increases and would have resulted in all living at subsistence level. Furthermore, in such circumstances, an insufficient surplus would have been available for defence purposes. In

these circumstances, social inequality was probably a more desirable alternative to equality from a long term development point of view.

Given the theory outlined here, a small dominant or ruling class was able to extract an economic surplus from the large dominated class. This limited the expansion in the size of the population of the dominated group who, however, after appropriation of the surplus, continued to live at subsistence level. The appropriation of this surplus enabled the ruling class to provide for military expenditure and to engage in capital accumulation, as well extravagant consumption. The development of their society depended on the balance achieved between these allocations of the economic surplus. Some rulers were able to contribute substantially by capital accumulation and by the advancement of knowledge to increased economic production. On the other hand, some rulers squandered the economic surplus and this resulted ultimately in the demise of their societies.

By modern standards, such a socioeconomic system might seem to be reprehensible but the alternative agrarian system involving equality would hardly have been more desirable, even if such societies could have survived external attacks. In the alternative egalitarian socioeconomic system, all would be doomed to live at subsistence level and no surplus would have been available for capital accumulation and for the advancement of knowledge.

It is true, as pointed out by Childe (1950, p. 16), that in an agrarian system dominated by a small group 'there seemed [to be] a glaring conflict on economic interests between the tiny ruling class, who amassed the bulk of the social surplus, and the vast majority who were left with a bare subsistence and effectively excluded from the spiritual benefits of civilisation'. It is, however, doubtful if the alternative of egalitarian distribution would have been superior from a development point of view.

A socioeconomic system based on agriculture and inequality existed for many millennia, and was only replaced by a different system following the Industrial Revolution. It can be argued that success of the Industrial Revolution depended on developments which occurred in agrarian based economies following the commencement of agriculture in the Neolithic period, although it is possible that the commencement of the Industrial Revolution was eventually retarded by the inequality present in preindustrial societies. The new economic system following the Industrial Revolution transformed social structures, and eventually enabled the bulk of populations in many societies to exist at standards of living well above the subsistence

level. However, the long term environmental sustainability of economic growth based on the existing economic system has become a subject of increasing concern even though it has enabled a larger global population to exist at a high standard of living than ever before.

8. Notes

1. This is a similar diagram to that which has often been used to illustrate one of the misallocation consequences of open access to natural resources (see for example, Tisdell, 2005, p. 136, Figure 6.1).
2. Various calculations suggest that a hunter gatherer would need roughly four square kilometres of land to feed him in a year's time while a very small chunk of land could support large number of agriculturists.
3. Because Childe was a committed Marxist (Faulkener, 2007), he was probably reluctant to accept the possibility that economic inequality based on the exploitation of the masses could be associated with the development of civilisation. This may explain the discrepancy in his conclusions.
4. In the fourth and third millennia BC, early cities, states, and civilisations arose near rivers in Egypt, Mesopotamia, the Indus Valley, and China.
5. Initially the Babylonian state in Mesopotamia and, somewhat later, the Hittite state in Anatolia were successful at bringing large territories under their control.
6. Before 3000 BC, speakers of a Proto Indo European language began to spread throughout Eurasia.
7. Writing appeared around 3300 BC in Mesopotamia; the largest group of texts is from Uruk.

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