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Population and Economic Growth in Australia: 8,000 BC - AD 1700 Extended to 60,000 BC

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Abstract. Data for the number of rock-shelter sites in Australia between 1000 and 10,000 years BP (before present or approximately between 8,000 BC and AD 1000) are analysed. They were interpreted by Johnson & Brook (2011) as representing the growth of population. Their claim of the Mid-Holocene intensification of the growth of population around 5000 years BP is contradicted by their own data. The puzzle of the Mid-Holocene turning point has been solved: there was no turning point. Their claim of the Mid-Holocene turning point relies on a precise position of a single point in the set of the already inaccurate data. Based on the fitted distribution to the data, the size of human population has been estimated between 8,000 BC and AD 1700 and tentatively extended down to 60,000 BC. The absolute values of the size of population were determined in relation to Maddison's data between AD 1 and 1700 (Maddison, 2010). Data of Maddison show also that the value of income per capita was constant below AD 1700. Using this information and the fit to the population data, economic growth in Australia was estimated down to 8,000 BC and tentatively extended to 60,000 BC.
Keywords: Australia, Population growth, Economic growth, Gross Domestic Product, Hyperbolic growth, Unified Growth Theory, Malthusian stagnation.
JEL. A10, A12, C12, C20, Y80.

1. Introduction

While data describing economic growth during the AD era are readily available (Maddison, 2001, 2010), similar data for the BC era are hard to find. However, De Long (1998) pointed out that if data for the growth of population are available, they can assist in calculating the Gross Domestic Product (GDP) during the BC era by using the income per capita (GDP/cap) values during the AD era because, income per capita values during the AD era converge quickly to an approximately constant value with the decreasing time (De Long, 1998; Nielsen, 2015). This property, which is nothing more than the mathematical property of dividing hyperbolic distributions (Nielsen, 2015), is mistakenly interpreted as stagnation.

A perfect example of such incorrect interpretation of data is the Unified Growth Theory (Galor, 2005a, 2011). It is a theory based fundamentally on distorted presentation of data and on using impressions created by such distorted presentations. It is an unreliable and misleading theory. The data were used in their distorted way but they were never analysed.

When data are presented in a grossly distorted way (Ashraf, 2009; Galor, 2005a, 2005b, 2007, 2008a, 2008b, 2008c, 2010, 2011, 2012a, 2012b, 2012c; Galor & Moav, 2002; Snowdon & Galor, 2008), they quickly lead to incorrect conclusions. However, when precisely the same data are analysed, they tell a diametrically different story (Nielsen, 2014, 2015, 2016a, 2016b, 2016c). They show that the

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Unified Growth Theory and all other similar interpretations of economic and population growth are contradicted by data. In particular, they show that the epoch of Malthusian stagnation did not exist and that there was no escape from the Malthusian trap because there was no trap. Analysis of data shows that the claimed by Galor mysteries of growth did not exist (Nielsen, 2016d, 2016e). It shows that the origin of the claimed mysteries was the distorted presentation of data. Galor created these mysteries by distorting data.

The aim of our discussion presented in this publication is to analyse data for the growth of human population in Australia. As demonstrated earlier (Nielsen, 2016a, 2016f), growth of population and economic growth are closely correlated. They follow nearly identical trajectories. Correct understanding of the growth of population helps also in the correct interpretation of the economic growth.

2. Data analysis

2.1. Rock shelters

Johnson & Brook (2011) analysed the time-dependent distribution of the number of rock-shelter sites in Australia, which they interpreted as representing the growth of ancient human population. The data, as obtained from Brook (2013), are displayed in Figure 1. They are also listed in Table 1. They represent the relative number of rock shelters because they were normalised to 100 at 10,000 years BP. Furthermore, it should be pointed out that in their Figure 4 (Johnson & Brook, 2011) data were shifted by 500 years (Brook, 2013). For instance, the number of rock shelters in 10,000 years BP was *assumed* to represent the number of rock shelters in 9,500 years BP. In our analysis, we shall use the data as supplied by Brook (2013) and as listed in Table 1.

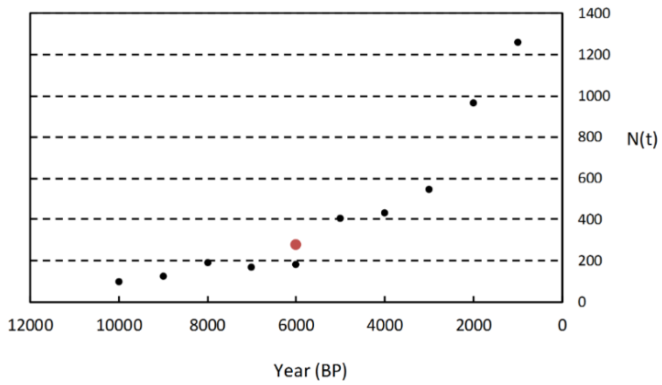

Figure 1. *Data (black dots) for the relative number of rock-shelter sites (Brook, 2013; Johnson & Brook, 2011) representing the growth of human population in Australia. The red dot represents a slightly shifted point at 6,000 years BP illustrating that their claim of the intensification of growth around that time depends entirely on the precise position of this single point belonging to the already inaccurate set of data.*

Table 1. *The relative number of rock shelters, $N(t)$, in Australia (Brook, 2013).*

Year (BP)	N(t)	Year (BP)	N(t)	Year (BP)	N(t)
1000	1263	4000	432	7000	168
2000	968	5000	405	8000	189
3000	547	6000	184	9000	126
				10000	100

These data seem to suggest a slow growth until around 6,000 years BP and a faster growth after that year. With their arbitrarily displaced presentation of data by 500 years, the apparent change in the growth pattern could be claimed for 5,000 years BP. Johnson & Brook (2011) concluded that the growth of human population was "slow or negligible before 5000 years ago, and faster since then" (Johnson & Brook, 2011). This observation led them inevitably to the question what might have triggered such a dramatic change in the growth pattern. "Whatever the trigger, our results provide new support for the view, advocated by some Australian archaeologists but contested by others, that something important happened to the human population of Australia during the Holocene, and that the Mid-Holocene in particular was a turning point in Australian prehistory" (Johnson & Brook, 2011).

So now, the vital questions are: Is their conclusion acceptable? Was there or was there not a significant change in the growth pattern of human population in Australia in the distant past? Was there really a turning point in the Australian prehistory? Did something important happen during the Holocene that affected dramatically the growth of population, and consequently also the economic growth?

If there was a change, we have the research field wide open and we can look for answers? However, if the interpretation of data was in some way incorrect and if there was no change, we will have saved a great deal of time, effort and financial resources by not pursuing the suggested line of investigation. We can then divert our efforts into more productive channels.

Before we go any further we should notice that this claim of a sudden intensification of growth around 5,000 years BP (or rather around 6,000 years BP if we plot the data correctly without shifting them by 500 years) depends entirely on *theprecise positionof just a single pointat 6,000 years BP in the already inaccurate set of data*. If this point is shifted only slightly up, as shown in Figure 1, the claim of the intensification is not justified because the data follow then an approximately monotonically increasing distribution. There is no justification for claiming the intensification of growth around 5,000 years BP or around 6,000 years BP. We could terminate our discussion at this stage and conclude that the data give no support to the claim of the intensification of growth. However, data for the growth of human population during the BC era are so rare that, if they become available, it is interesting to analyse them to gain perhaps new information on a related topic.

In order to understand data, it is useful to look at them from a new angle. For instance, semilogarithmic display of data is useful because it identifies easily exponential growth. If data follow approximately a straight line, then the growth is approximately exponential. Data analysed by Johnson and Brook (2011) are presented in Figure 2 using logarithmic scale for the vertical axis.

We can now see clearly that the data follow a *monotonically* increasing trajectory with no sign of any unusual acceleration or intensification. The two phases of growth, fast and slow, did not exist. There was no transition from a slow to a fast growth and there was nothing unusual in the growth pattern around 6,000 years BP [or around 5,000 years BP if we use the arbitrarily shifted data of Johnson & Brook (2011)]. Trying to explain the unusual change in the number of sites around that time or around any other time is irrelevant because there is no convincing evidence that there was a change. On the contrary, in this display, the data follow closely a straight line suggesting exponential growth over the entire range of time.

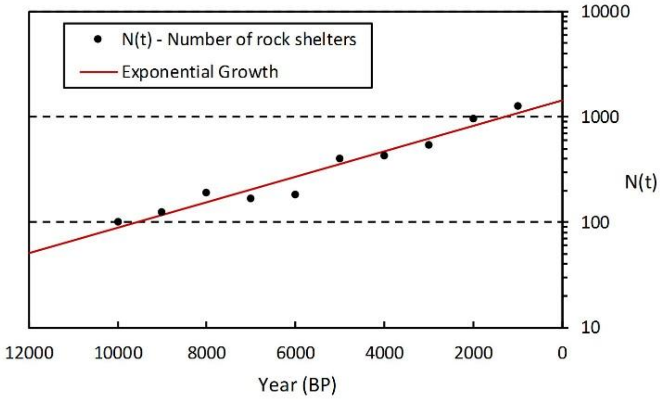

Figure 2. *The number of rock-shelter sites $N(t)$ shown in Figure 1 is now plotted using semilogarithmic display. The data follow closely exponential distribution. There is no justification for claiming the intensification of growth around 6,000 years BP*

Exponential distribution is described by the following equation:

$$N(t) = ae^{rt} \tag{1}$$

where, for the distribution presented in Figure 2, $a = 1.114 \times 10^3$ and $r = -2.790 \times 10^{-4}$.

The growth rate r is in fact positive but in this equation, it is expressed as negative because the time is expressed in years before present. The number of rock shelters was *increasing* with time.

Another useful way to examine data and to understand their trend is to plot and to analyse their reciprocal values (Nielsen, 2014). This type of display is shown in Figure 3.

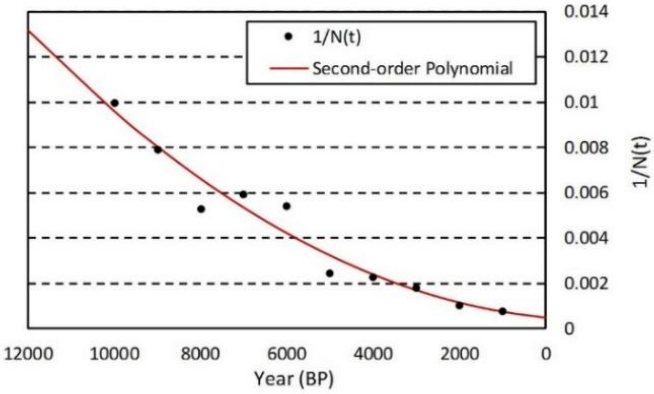

Figure 3. *Reciprocal values,* $1/N(t)$*, of the number of rock-shelter sites in Australia. There is no sign of any intensification in the number of rock shelters claimed by Johnson & Brook (2011). The best and the simplest fit to the reciprocal values of data is by the second-order polynomial.*

In this representation, an unusual acceleration or intensification in the number of rock shelters would be indicated by a clear *downward* change in the growth pattern. In contrast, data show that the trajectory of the reciprocal values was gradually bending *upwards*. There is no sign of any intensification of growth claimed by Johnson & Brook (2011), not only around 6000 years BP (or around 5000 years BP, depending on how the data are plotted) but also at any time during this section of time. The reciprocal values of data for the number of rock-shelter sites in Australia decrease monotonically with time indicating a monotonic increase in the number of rock shelters. The best and the simplest fit to the reciprocal values of data is by using the second-order polynomial.

We can now combine our analysis of rock shelters in Australia in one figure. Results are presented in Figure 4.

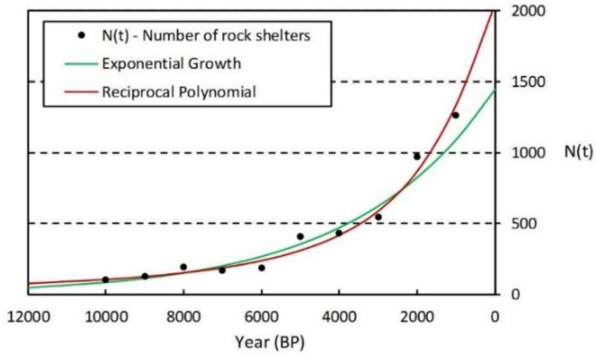

Figure 4. *Mathematical analysis of the number of rock shelters in Australia. The best description of data is by using the reciprocal of the second-order polynomial.*

Initially, the growth of the number of rock shelters can be described well using exponential function or the reciprocal of the second-order polynomial but the reciprocal of the second-order polynomial gives a better overall description of data. This distribution is given by the following equation:

$$N(t) = \left(a_0 + a_1 t + a_2 t^2\right)^{-1} \tag{2}$$

where t is the time in years BP, $N(t)$ is the number of rock-shelter sites, $a_0 = 4.882\times10^{-4}$, $a_1 = 1.861\times10^{-7}$ and $a_2 = 7.255\times10^{-11}$.

So now the puzzling conundrum, acknowledged by some Australian archaeologists (Lourandos, 1997) but contested by others (Hiscock, 2008) has been solved, and the approach is so simple: just a different way of plotting the same set of data and by carrying a simple mathematical analysis of data. Nothing "important happened to the human population in Australia during the Holocene" (Johnson & Brook, 2011) and there was no "turning point in Australian prehistory" (Johnson & Brook, 2011), at least no turning point with respect to the number of rock-shelter sites. There was no trigger and no transition requiring explanation. The number of rock shelters was increasing monotonically over the whole time. The mechanism of the sudden intensification of growth does not have to be explained because there was no intensification.

2.2. Growth of population

We can now go a step further and analyse the historical growth of human population in Australia. To this end, we have to translate the number of rock shelters into the size of human population. We shall assume that the size of population was proportional to the number of rock shelters. This approximation works well even if an approximate fixed fraction of the population did not live in rock shelters. For the calibration purpose, we shall use Maddison's data (Maddison, 2010). They overlap the data for the rock shelters at 1000 and 2000 years BP, i.e. at approximately AD 1000 and 1, respectively. The combined data are listed in Table 2 and are also shown in Figure 5 as dots. They extend only to AD 1700 because between AD 1700 and 1800 the steady growth of population was interrupted by the British colonisation. The population in Australia decreased from the estimated 450,000 in AD 1700 to 334,000 in 1820. From around 1840 it started to increase rapidly reaching the first million in 1856 and two million in 1877 (Maddison, 2010). This pattern appears to represent the initial decrease in the aboriginal population followed by the intensified increase in the number of people arriving in Australia.

Table 2. *Growth of human population in Australia, 8,000 BC – AD 1700. The size $S(t)$ is in thousands.*

Year	S(t)	Year	S(t)	Year	S(t)
8000 BC	34	4000 BC	63	AD 1	346
7000 BC	43	3000 BC	139	AD 1000	417
6000 BC	65	2000 BC	149	AD 1500	450
5000 BC	58	1000 BC	188	AD 1600	450
				AD 1700	450

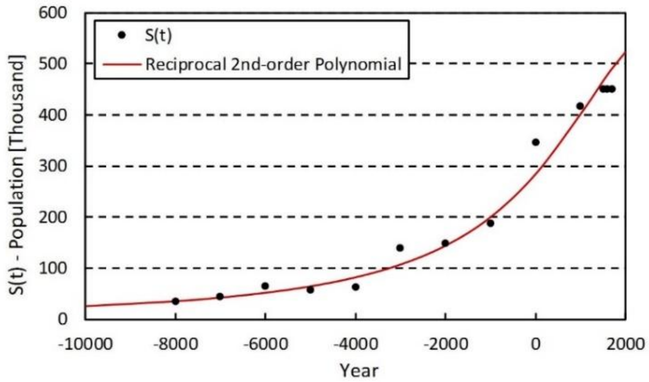

Figure 5. *Growth of human population in Australia, 8,000 BC – AD 1700. The BC years are represented by the negative numbers. The size of population was increasing monotonically. There was no intensification of growth at any time. Growth of population is described remarkably well by the reciprocal of the second-order polynomial [eqn (3)].*

Population in Australia was increasing monotonically between 8,000 BC and AD 1500. There was no intensification of growth at any time. The growth is described well by the reciprocal of the second-order polynomial:

$$S(t) = \left(b_0 + b_1 t + b_2 t^2\right)^{-1} \tag{3}$$

where $S(t)$ is the size of population and t is the time (negative for the BC era). Parameters reproducing the growth of population between 8,000 BC and AD 1500 are: $b_0 = 3.524\times10^{-3}$, $b_1 = -1.256\times10^{-6}$ and $b_2 = 2.254\times10^{-10}$.

This formula reproduces the data so well that it can be used to calculate the size of population at any time between 8,000 BC and AD 1500 or even to extend the estimations to AD 1700 and below 8,000 BC. The calculated values are listed in Tables A1 and A2 in the Appendix. They are close to the empirical values listed in Table 5. There is a certain degree of discrepancy between the predicted values in AD 1600 and 1700. Maddison's data give 450,000 for these two years while the predicted values are 474,000 and 485,000 respectively.

We can also use the determined parameters to calculate the growth rate, which is given by the following formula:

$$R(t) \equiv \frac{1}{S(t)}\frac{dS(t)}{dt} = -\frac{dZ(t)}{dt}S(t), \tag{4}$$

where

$$Z(t) = S^{-1}(t). \tag{5}$$

Explicitly, for the eqn (3), the growth rate

$$R(t) = -(b_1 + 2b_2 t)S(t) = -\frac{b_1 + 2b_2 t}{b_0 + b_1 t + b_2 t^2}. \tag{6}$$

Calculated size of human population in Australia (in thousands) and the corresponding growth rate (in per cent) are shown in Figure 6. The growth rate was increasing steadily but it reached a maximum around AD 1.

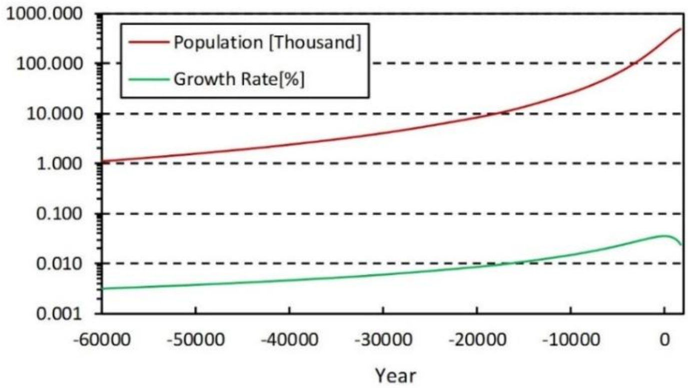

Figure 6. *Calculated size of human population in Australia between 60.000 BC and AD 1700 (in thousands) and the corresponding growth rate (in per cent).*

We should also notice that the parameter $b_2 = 2.254\times10^{-10}$ is small. Mathematical description of the growth of human population in Australia is, therefore, similar to the mathematical description of the historical growth of global and regional populations and to the mathematical description of the historical economic growth (Nielsen, 2016a, 2016f, 2016g). They are all described well using the first-order hyperbolic distributions given by the following simple equation:

$$S(t) = (a - kt)^{-1}. \qquad (7)$$

Considering that $b_2 < |b_1|$,

$$S(t) = \left(b_0 + b_1 t + b_2 t^2\right)^{-1} \approx (b_0 + b_1 t)^{-1} = (a - kt)^{-1}. \qquad (8)$$

Distribution, given by the eqn (3) and shown in Figures 5 and 6, is similar to the well-known, and ever-present hyperbolic distribution, given by the eqn (7), which describes so well economic and population growth, global and regional (Nielsen, 2016a, 2016f, 2016g), even down to 10,000 BC for the growth of population. These similarities are shown in Figure 7. The distribution labelled as the *Second-order Hyperbola* (the reciprocal of the second-order polynomial) describes the growth of human population in Australia. It was calculated using the eqn (3) and the empirically determined parameters b_0, b_1 and b_2 listed under this equation. The distribution labelled as the *First-order Hyperbola* (the reciprocal of the first-order polynomial, i.e. the reciprocal of the linear function) was calculated using the eqn (7) and parameters $a = b_0$ and $k = -b_1$. The two distributions differ only by the presence (or absence) of the parameter b_2. For the first-order hyperbolic distribution, $b_2 = 0$. For the second-order hyperbolic distribution $b_2 = 2.254\times10^{-10}$. Another essential difference is that, for this set of parameters, the distribution describing the growth of ancient population in Australia does not escape to infinity at a fixed time.

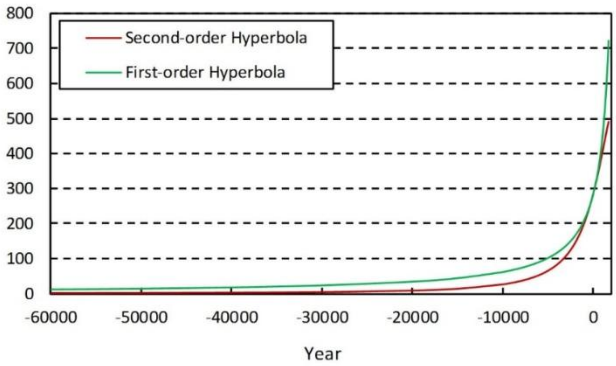

Figure 7. *Characteristic features of the second-order hyperbolic distribution [eqn (3)] describing the growth of population in Australia are similar to the characteristic features of the first-order hyperbolic distribution [eqn (7)]. Parameters used in the calculations are* $b_0 = a = 3.524\times10^{-3}$, $b_1 = -k = -1.256\times10^{-6}$ and $b_2 = 2.254\times10^{-10}$.

Considering the omnipresence of hyperbolic distributions (Nielsen, 2016a, 2016f, 2016g) and that the growth of population in Australia can be so well described using a similar distribution between 8,000 BC and AD 1500 or even 1700, estimation of the size of the population listed in Table A1 was extended tentatively down to 60,000 BC. The widely-accepted date for the arrival of humans in Australia is around 40,000 years ago (Hiscock, 2008) but it could have been also as early as 60,000 years ago (Lourandos, 1997).

There is also a close similarity between the growth of population in Australian and the growth rate calculated using a simpler, first-order hyperbolic distribution. The growth rate for the first-order hyperbolic distribution given by the eqn (7) is

$$R(t) = kS(t)\,. \tag{9}$$

However, considering that for the growth of population in Australia $b_2 < |b_1|$, the corresponding growth rate, given by the eqn (6)

$$R(t) = -(b_1 + 2b_2 t)S(t) \approx -b_1 S(t) = |b_1| S(t)\,, \tag{10}$$

because $b_1 < 0$.

3. Economic growth

According to Maddison (2010), income per capita in Australia between AD 1 and 1700 was constant. Expressed in terms of the 1990 International Geary-Khamis dollars, it was \$400. The approximately constant values of income per capita can be easily explained as simply representing the mathematical property of dividing hyperbolic (or hyperbolic-like) distributions (Nielsen, 2015). Using the suggestion of De Long (1998), this property can be used to calculate the past GDP values from the estimated size of population. Economic growth can be assumed to be directly proportional to the size of the population.

The scaling factor for Australia is \$400 (1990 International Geary-Khamis dollars). Thus, for instance, the estimated size of Australian population around 40,000 BC is 2,000 and, consequently, the estimated GDP is \$800,000. The estimated size of population between 60,000 BC and AD 1700 is listed in Tables A1 and A2. These values can be used to calculate the size of the GDP. The corresponding values after AD 1700 are listed by Maddison (2010).

It is obvious that no-one in Australia, or in any other region for that matter, was calculating the values of the GDP, let alone calculating them in the 1990

International Geary-Khamis dollars in that distant time. The listed values for Australia and for other regions or countries, published by Maddison (2010) for such remote time can serve only as a guide for the *relative* size of the common wealth. Thus, for instance we cannot claim that the value of the GDP in 40,000 BC in Australia was indeed $800,000 but we can estimate that the common wealth in Australia in AD 1700 was about 250 times larger than in 40,000 BC and about 20 times larger than in 10,000 BC. Using the listed values and the values published by Maddison (2010) we can also estimate that the GDP in Australia in AD 2000 was about 5,000 times larger than the common wealth of the aboriginal population around 40,000 BC and about 400 times larger than in 10,000 BC. The estimated growth rate of the GDP below AD 1700, or equivalently the estimated growth rate of the common wealth in Australia is, of course, given by the estimated growth rate of population listed in Tables A1 and A2.

Economic growth in Australia was slow but the growth rate was increasing monotonically until around AD 1, when it started to decrease (see Figure 6). From around that time, the size of the common wealth, as expressed now in terms of the estimated GDP, continued to increase but at the ever-decreasing growth rate. Such a pattern could lead either to a maximum or to the levelling off of the size of the GDP. The use of natural resources by the aboriginal population was exceptionally prudent and parsimonious. Such economic growth could have been sustained practically indefinitely.

Even if the growth rate stopped to decrease from AD 1700 and remained constant, the doubling time for the corresponding exponential growth would have been around 3000 years. The GDP would have increased from $180 million in AD 1700 to only $360 million in around 4700. There was obviously much room for improving the living conditions without the excessively rapid economic growth.

The invasion of Australia changed everything and soon the GDP started to increase rapidly. Rather than doubling in about 3000 years, it doubled in only 135 years soon after AD 1700. By the year 2000, the GDP in Australia increased to $414,058 million. Measured in the constant currency of the 1990 International Geary-Khamis dollars, it was 2300 times larger than in AD 1700. The current growth of the GDP doubles approximately every 22 years. Such a rapid growth is unsustainable.

4. Summary and conclusions

We have analysed the time dependence of the relative number of rock shelters in Australia. They were assumed by Johnson & Brook (2011) to represent the growth of aboriginal population.

We have found that the growth of population can be best described using the reciprocal of the second-order polynomial. Our analysis shows that within the range of analysable data between 8,000 BC and AD 1700, the generally claimed mythical epoch of the so-called Malthusian stagnation did not exist even in Australia and even in this distant time when early humans must have encountered numerous adverse conditions. Growth of population in Australia was increasing monotonically. It was slow, but definitely not stagnant.

Using the fitted distribution, we have calculated the size of aboriginal population between 8,000 BC and AD 1700. The calculated values are close to the values determined from the study of the number of rock shelters. However, calculations based on the fitted curve allow for filling in the gaps between data.

We have shown that the reciprocal of the second order polynomial, which reproduces the growth of population in Australia, is in the same class as the hyperbolic distributions describing global and regional economic growth and the growth of population (Nielsen, 2016a, 2016f, 2016g). Considering the common presence of hyperbolic distributions and the excellent fit to the data between 8,000 BC and AD 1700, we have tentatively extended our estimates of the size of population in Australia down to 60,000 BC.

It should be remembered, however, that the estimated historical size of Australian population is based on the assumption that it is directly proportional to the relative number of rock shelters. If this assumption is incorrect, then obviously, the estimated size of the population is also incorrect. However, this is the simplest assumption and in science simplest assumptions are usually preferable.

Our analysis solves the puzzle of the so called Mid-Holocene turning point. According to Johnson & Brook (2011), there was a turning point in the growth of human population in Australia around 5,000 years ago. The growth of population was supposed to have been "slow or negligible before 5000 years BP, and faster since then" (Johnson & Brook 2011). "Whatever the trigger, our results provide new support for the view, advocated by some Australian archaeologists but contested by others, that something important happened to the human population of Australia during the Holocene, and that the Mid-Holocene in particular was a turning point in Australian prehistory" (Johnson & Brook 2011).

This puzzle has now been solved: there was *no* Mid-Holocene turning point in the growth of aboriginal population in Australia. The number of rock shelter sites and the corresponding size of population were increasing *monotonically* between 8,000 BC (approximately 10,000 years BP) and AD 1500 or even 1700. The so-called evidence about the Mid-Holocene turning point is based totally on the position of just a *single* point in the distribution of the already imprecise data (see Figure 1). Relying on just a single point to draw far-reaching conclusions is unacceptable, particularly if, as it is in this case, the data are already inaccurate. Our analysis of data shows that there is nothing remarkable about this single point. It is as close to the calculated distributions as all other points (see Figures 2-5).

With the exception of the recent surge, growth of human population in Australia over the past 10,000 years was remarkably stable and was following closely the distribution described by the reciprocal of the second-order polynomial, which is similar to the commonly observed hyperbolic distributions. Splitting this monotonically increasing growth of population into two distinct segments, as attempted by Johnson & Brook (2011), and trying to explain them by assuming different mechanisms of growth is not only unnecessary but also incorrect. There is nothing to explain about the change in the mechanism of growth because there was no change. However, the data suggest a remarkable and perhaps unexpected feature which could be further investigated. Why was the growth of the ancient human population in Australia so stable, so robust and so resilient to any variable forces over such a long time of around 10,000 years but maybe even over around 60,000 years?

Historical growth of population and historical economic growth in Australia fit well into the generally observed pattern of hyperbolic growth (Nielsen, 2016a, 2016f, 2016g; von Foerster, Mora & Amiot, 1960). Many serious mistakes have been made with the interpretation of such distributions and a good example is the Unified Growth Theory (Galor, 2005a, 2011). These distributions are seen as being made of two distinctly different components, slow and fast. Sometimes a third component is inserted between these two. The perceived slow component is then interpreted as stagnation and the perceived fast component as explosion or takeoff. However, such interpretations are incorrect because hyperbolic distributions increase monotonically. The two distinct components (or stages of growth, or regimes of growth) do not exist. Each hyperbolic distribution or hyperbolic-like distribution, as it is in the case of the growth of ancient population in Australia, has to be interpreted as a whole and the same mechanism has to be applied to the slow and fast growth.

Similar mistake was made by Johnson & Brook (2011) who claimed the intensification of growth around 5,000 years BP. They also divided the monotonically increasing distribution into two stages, slow and fast with an apparent intensification at a certain time. This intensification never happened. They made the same mistake as it is repeatedly made with the interpretation of the historical growth of population and the historical economic growth when the apparent but non-existent intensification is described as takeoff, explosion, sprint or spurt, the features contradicted by the methodical analysis of data.

It is curious that in many publications excellent data are used but they are never analysed (Ashraf, 2009; Galor, 2005a, 2005b, 2007, 2008a, 2008b, 2008c, 2010, 2011, 2012a, 2012b, 2012c; Galor & Moav, 2002; Snowdon & Galor, 2008). It is also curious that the mistake of failing to analyse data is compounded by presenting them in a grossly distorted manner. It is as if data were deliberately manipulated to support erroneous preconceived ideas. Such an approach to research is scientifically unacceptable. It cannot lead to reliable conclusions and in these cases, it did not. All these publications are contradicted by the same data, which in their distorted way were used to promote the erroneous concepts.

Theories such as, the Unified Growth Theory and the Demographic Transition Theory are consistently contradicted by data and by their analyses (Biraben, 1980; Clark,1968; Cook,1960; Durand, 1974; Gallant, 1990; Haub, 1995; Kapitza, 2006; Kremer, 1993; Lehmeyer, 2004; Livi-Bacci, 1997; Maddison, 2001, 2010; Mauritius, 2015; McEvedy & Jones, 1978; Nielsen, 2014, 2015, 2016a, 2016b, 2016c, 2016d, 2016e, 2016f, 2016g, 2016h, 2016i, 2016j, 2016k; Podlazov, 2002; Shklovskii, 1962, 2002; Statistics Mauritius, 2014; Statistics Sweden, 1999; Taeuber & Taeuber, 1949; Thomlinson, 1975; Trager, 1994, United Nations, 1973, 1999, 2013; von Hoerner, 1975, von Foerster, Mora & Amiot, 1960; Wrigley & Schofield, 1981). There is no gain in continuing to use these theories. They have to be replaced by new theories which incorporate scientific evidence. In particular, there is no gain in continuing to use the concepts of Malthusian stagnation, Malthusian trap, escape from the Malthusian trap and all other associated concepts because they are contradicted by data and they do not help to explain the mechanism of growth. These concepts are incorrect and misleading. Any attempt to explain the mechanism of the past growth of population or the economic growth should be based on accepting the monotonically increasing hyperbolic distributions

For distributions describing the growth of population and the economic growth, even though the growth was slow it was not stagnant. Even though over a sufficiently long time the growth becomes significantly faster, there is no sudden takeoff or explosion. Hyperbolic distributions can be misleading but their analysis is trivially simple (Nielsen, 2014). Anyone can do it to avoid being misguided by their deceptive features. Hyperbolic distributions are slow over a long time and fast over a short time but they increase monotonically and they cannot be divided into distinctly different stages of growth. The characteristic features of hyperbolic distributions describing the historical economic growth and the historical growth of population should be correctly recognised and accepted in the demographic and economic research.

Appendix

Table A1: *Growth of human population in Australia, 60,000 – 100 BC. The size of population, $S(t)$, is in thousands. The growth rate, $R(t)$, is in per cent (%).*

Year (BC)	S(t) (000)	R(t) (%)	Year (BC)	S(t) (000)	R(t) (%)
60000	1	0.0032	3200	102	0.0274
50000	2	0.0038	3100	104	0.0277
40000	2	0.0047	3000	107	0.0280
30000	4	0.0061	2900	110	0.0283
20000	8	0.0086	2800	114	0.0286
15000	14	0.0110	2700	117	0.0289
10000	26	0.0149	2600	120	0.0292
9500	28	0.0155	2500	124	0.0295
9000	30	0.0161	2400	128	0.0298
8500	33	0.0167	2300	131	0.0301
8000	36	0.0174	2200	136	0.0305
7500	39	0.0181	2100	140	0.0308
7000	43	0.0189	2000	144	0.0311
6500	47	0.0197	1900	149	0.0314
6000	52	0.0207	1800	153	0.0317
5800	54	0.0210	1700	158	0.0320
5600	57	0.0214	1600	164	0.0324
5400	59	0.0219	1500	169	0.0327
5200	62	0.0223	1400	175	0.0330
5000	65	0.0227	1300	181	0.0333
4800	68	0.0232	1200	187	0.0336
4600	71	0.0237	1100	193	0.0338
4400	75	0.0241	1000	200	0.0341
4200	78	0.0247	900	207	0.0344
4000	82	0.0252	800	214	0.0346
3900	84	0.0254	700	222	0.0348
3800	87	0.0257	600	229	0.0350
3700	89	0.0260	500	238	0.0352
3600	91	0.0263	400	246	0.0354
3500	94	0.0265	300	255	0.0355
3400	96	0.0268	200	264	0.0356
3300	99	0.0271	100	274	0.0356

To calculate the GDP, expressed in the 1990 International Geary-Khamis dollars, multiply the size of population, $S(t)$, by \$400. The GDP values after AD 1700 are listed by Maddison (2010). Growth rate is the same for the growth of population and for the economic growth.

Table A2: *Growth of human population in Australia, AD 1- 1700.The size of population, $S(t)$, is in thousands. The growth rate, $R(t)$, is in per cent (%).*

Year (AD)	S(t) (000)	R(t) (%)	Year (AD)	S(t) (000)	R(t) (%)
1	284	0.0357	850	382	0.0333
50	289	0.0356	900	388	0.0330
100	294	0.0356	950	395	0.0327
150	299	0.0356	1000	401	0.0323
200	305	0.0355	1050	408	0.0319
250	310	0.0355	1100	414	0.0315
300	316	0.0354	1150	421	0.0310
350	321	0.0353	1200	427	0.0306
400	327	0.0352	1250	434	0.0301
450	333	0.0351	1300	440	0.0295
500	339	0.0349	1350	447	0.0289
550	345	0.0348	1400	453	0.0283
600	351	0.0346	1450	460	0.0277
650	357	0.0344	1500	466	0.0270
700	363	0.0342	1550	472	0.0263
750	369	0.0339	1600	478	0.0256
800	376	0.0336	1650	484	0.0248
			1700	490	0.0240

To calculate the GDP, expressed in the 1990 International Geary-Khamis dollars, multiply the size of population, $S(t)$, by \$400. The GDP values after AD 1700 are listed by Maddison (2010). Growth rate is the same for the growth of population and for the economic growth.

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