

# Lattice Energy LLC

*Commercializing a next-generation source of CLENR energy*

## Important Update

**New data in recent articles supports our conjecture  
of unexpectedly rapid deceleration in population growth**

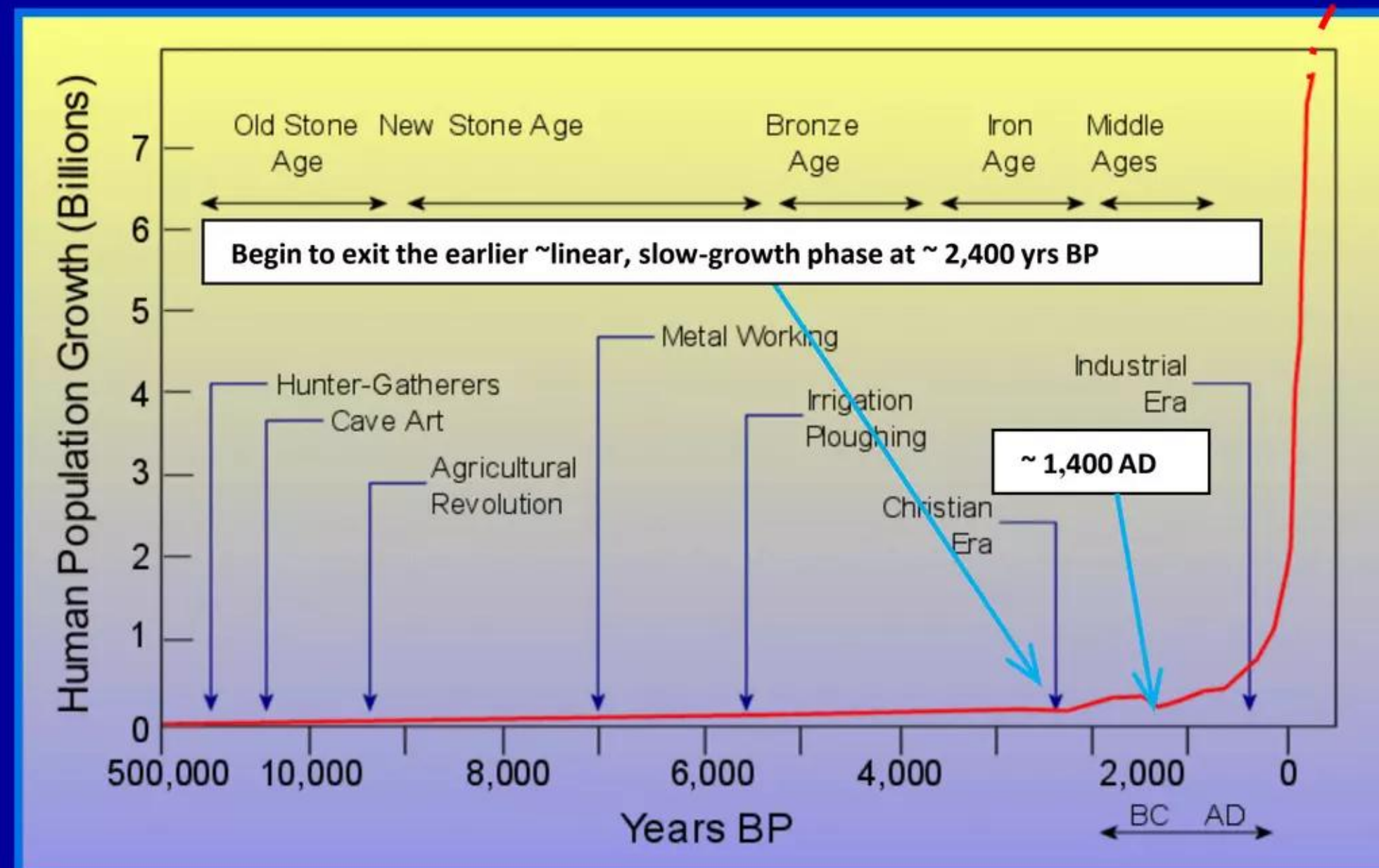
*Important macroeconomic, geopolitical, and long-term energy demand implications if correct*

**Update on our previous report dated August 29, 2011**

**Lewis Larsen**

**? What next**

After > 500,000 years of slow, ~linear growth, in ~1,400 AD (just after “*Black Death*” depopulated Europe) human population growth began to accelerate nonlinearly; hyperbolically of late, going vertical with no end in sight. This scary observation has been grist for Malthusian pundit mills and environmentalists with axes to grind. This issue exploded into the public consciousness 44 years ago with publication of Paul Erlich’s famous 1968 book, “*The Population Bomb*.” It has been episodically ballyhooed by many pundits and doomsayers ever since.



1996: key event in history of confused thinking about human population growth was publication of brilliant theoretical model by a Russian physicist as follows:

*“The phenomenological theory of world population growth,”* Prof. Sergey P. Kapitsa, Moscow Institute for Physics and Technology and Russian Academy of Sciences *Physics-Uspekhi* **39** pp. 57 – 71 (1996)

Kapitsa predicted global human population growth would finally begin to slow-down and eventually level-out in the near future.

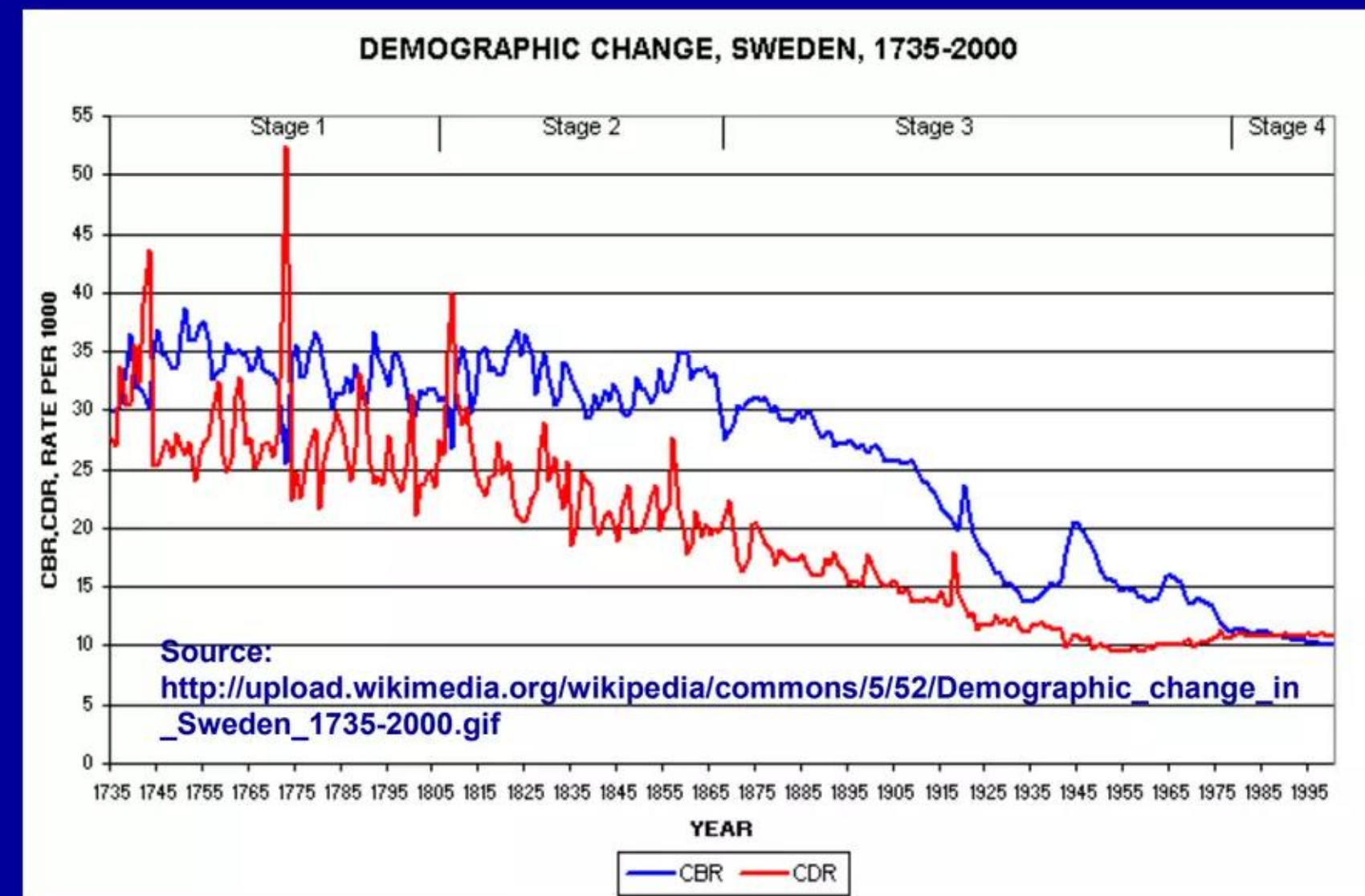
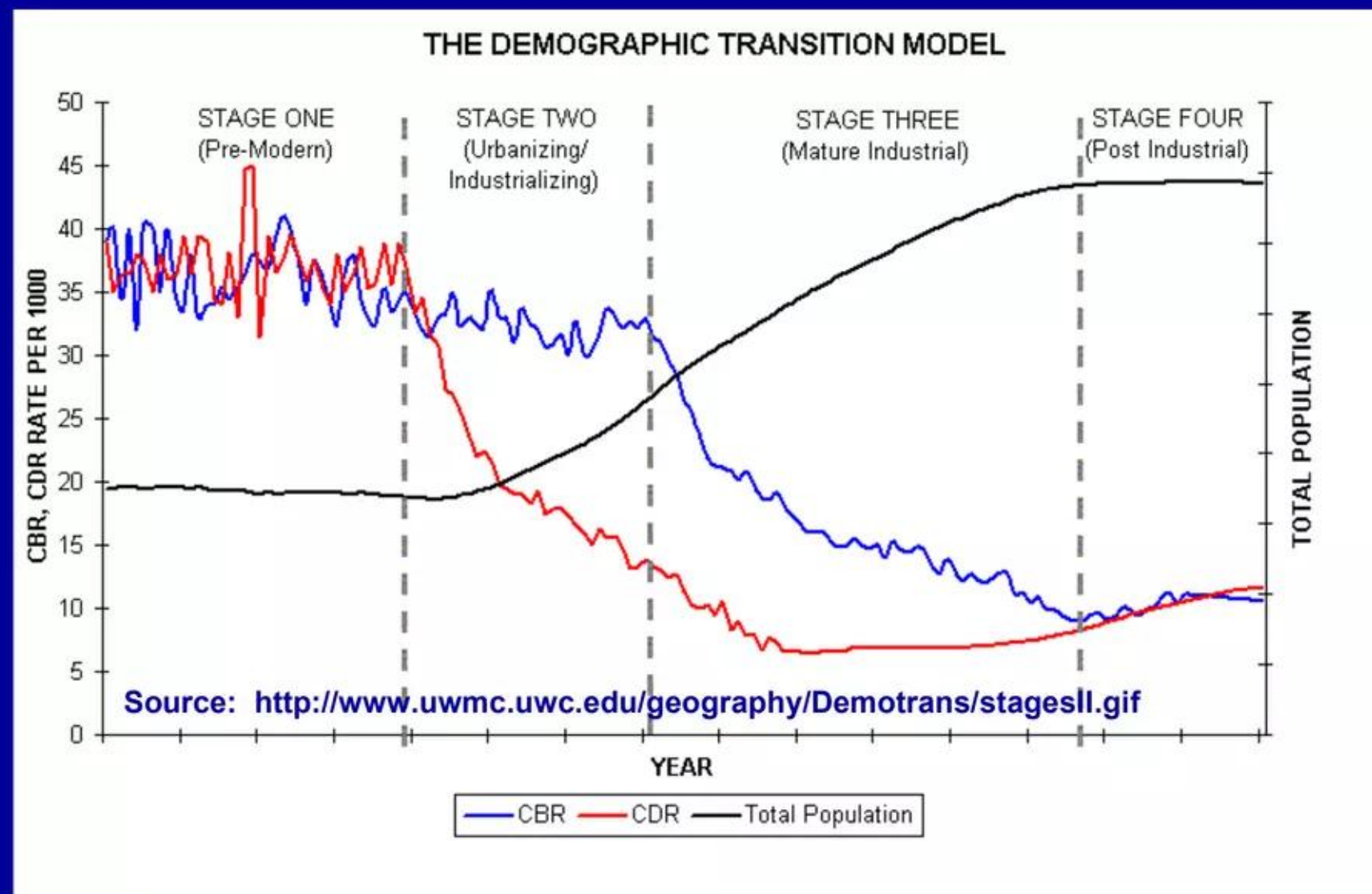


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### Demographic human population growth models:

Following the intellectual lead of Kapitsa in the wake of his brilliant 1996 theory paper, so-called “*demographic*” models of human population growth recently became acceptable concepts. The basic idea, as illustrated in the charts below, is that birth vs. death rates go through four characteristic ‘stages’ as human societies, i.e., individual countries, progress through a series of conceptually identifiable steps in their evolution toward more complex social, organizational, economic, and technological structures:



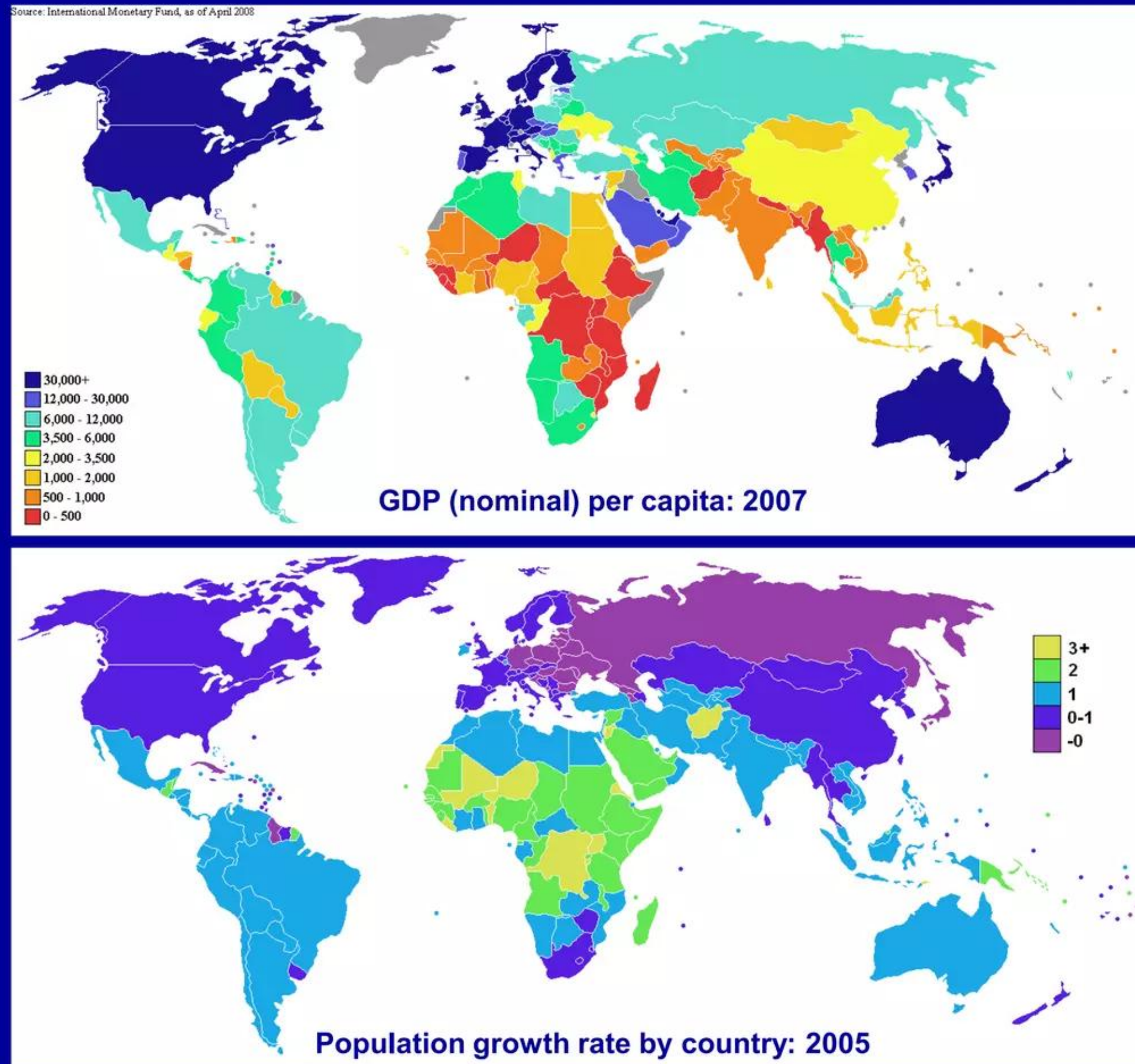
In fact, when detailed historical time-series data are actually available for any given country, it does appear to provide strong confirmation of future forecasts made by different ‘flavors’ of “*demographic transition*” population growth models; e.g., please see chart showing demographic change that occurred in Sweden from 1735 - 2000 (to the right above) and then compare it to idealized model shown to the left. *The data's agreement with the model is remarkable.*



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The following two charts show GDP per capita (2007) versus population growth rate (2005) by country:



It is obvious by simple visual inspection that the demographic transition model is probably correct; that is, stunted economic development and lower per capita nominal GDP are closely associated with higher effective rates of human population growth. *Importantly, this model unequivocally predicts that rates of global population growth must fall even further from whatever they may be today if rates of economic growth and educational opportunities are substantially improved in less developed countries shown above.*



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**38-page private Lattice report issued on August 29, 2011**

***“Latest Data Suggests Global Population Growth is Slowing”***

***“Unexpectedly fast deceleration may have profound implications for economics, geopolitics, energy demand, and resource depletion”***

***“First Fischer ‘period of equilibrium’ for 600 years in which population growth is decelerating, instead of accelerating; future price stability and huge increases in global per capita income?”***

**8-page public excerpt from this private report is available for free online viewing or download at:**

<http://www.slideshare.net/lewisglarsen/population-growth-decelerating-faster-than-expected-consequences-for-next-50-years-larsen-excerpt-aug-29-2011>

**Macroeconomic and other related ramifications of this new socioeconomic population phenomenon are discussed in a recent Lattice report as follows:**

***“International competitiveness, macroeconomics, technology, energy, and the long sweep of history”***  
**Lewis Larsen, April 14, 2012 [19 pages in 8.5 x 11 document format – incl. electronic copies of 1985 theory paper + 3 Barron’s magazine articles by Jon Laing that are embedded within the document]**

<http://www.slideshare.net/lewisglarsen/lattice-energy-llc-macroeconomics-technology-and-long-sweep-of-history-april-14-2012>



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## Highlights & conclusions from Aug. 29, 2011 Lattice report

### *“Latest Data Suggests Global Population Growth is Slowing”*

- ✓ “Latest census data shows that world population growth appears to be decelerating significantly faster than most had been expecting; such a slowdown is consistent with predictions of various demographic transition models, beginning with key theoretical work of Kapitsa (1996), which posits that population growth is a self-limiting phenomenon described by sigmoid or S-curves “
- ✓ “One prediction of demographic transition models, that significant increases in per capita GDP and related improvements in standard of living are strongly correlated with slowdowns in population growth, has been validated in every country for which historical time-series data are available”
- ✓ “Evaluating 1,000 years of quantitative socioeconomic data, Fischer (1996) published a novel developmental model claiming that during the past millennium there have been four long-duration, transnational ‘Great Waves’. Each is comprised of both a noninflationary ‘period of equilibrium’ averaging 70 – 90 years in duration followed by a longer, more variable-duration inflationary period called a ‘price revolution’. Further postulated that root cause of inflation during all four price revolutions to date was excessive rates of population growth; no explanation was given for key driving force(s) that causes subsequent periods of equilibrium”
- ✓ “Larsen completes Fischer’s conceptual model by postulating that periods of equilibrium are mainly triggered and maintained by bursts of innovation and deployment of newly commercialized technologies, broadly writ; further hypothesizes (more-or-less in agreement with Fischer) that a new period of equilibrium began *circa* 1979-1980 that may potentially last until ca. 2065; that hypothesis is supported by quantitative data showing worldwide explosion in new patent issuance”
- ✓ “Conclusion: excessive population growth is unlikely to pose a problem during the era of today’s new period of equilibrium; i.e., if history is any guide, based on historical norms a la Fischer the current period of equilibrium is likely to endure until at least ca. 2065, all other things being equal.”



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## Highlights & conclusions from Aug. 29, 2011 Lattice report

### *“Latest Data Suggests Global Population Growth is Slowing”*

- ✓ “Empirical data is presented (Huber & Mills - 2005; Brown et al. - 2011) showing that growth in per capita GDP (which is what reduces population growth rates) is strongly correlated with corresponding increases in total energy demand which, in modern energy-intensive societies, determines the overall standard of living; measured against finite fossil fuel supplies and other non-renewables, ratcheting demand exacerbates energy supply issues as GDP growth continues”
- ✓ *“Conclusion: single greatest threat to the probable longevity of the present period of equilibrium is huge energy price inflation because available global energy supplies are unable to keep-up with rising demand; new energy technologies must be developed and deployed to avert this.”*

India & China now account for 40% of the world's population

**Note:** in 2008 India (not shown in Huber-Mills' chart) had est. GDP (\$1000/Capita) of 1.327 and Energy Use (Million Btu/Capita) of 12.6, placing it near origin of bold blue arrow in the lowermost corner of the left quadrant;

Upward progression of countries along the trajectory of blue arrow creates increases in total world energy demand. The faster GDP per capita rises in all countries, the faster total global energy demand increases.

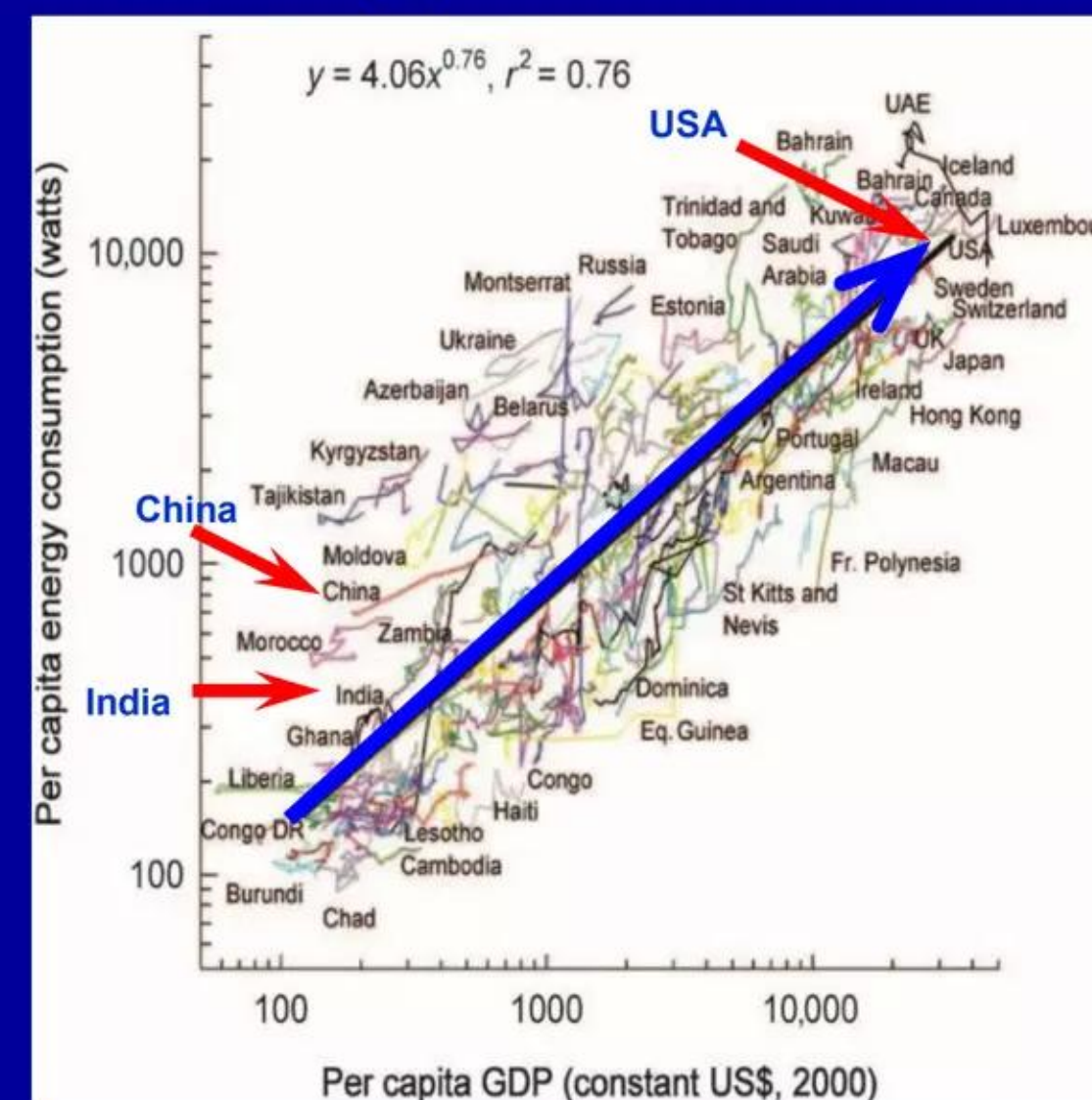
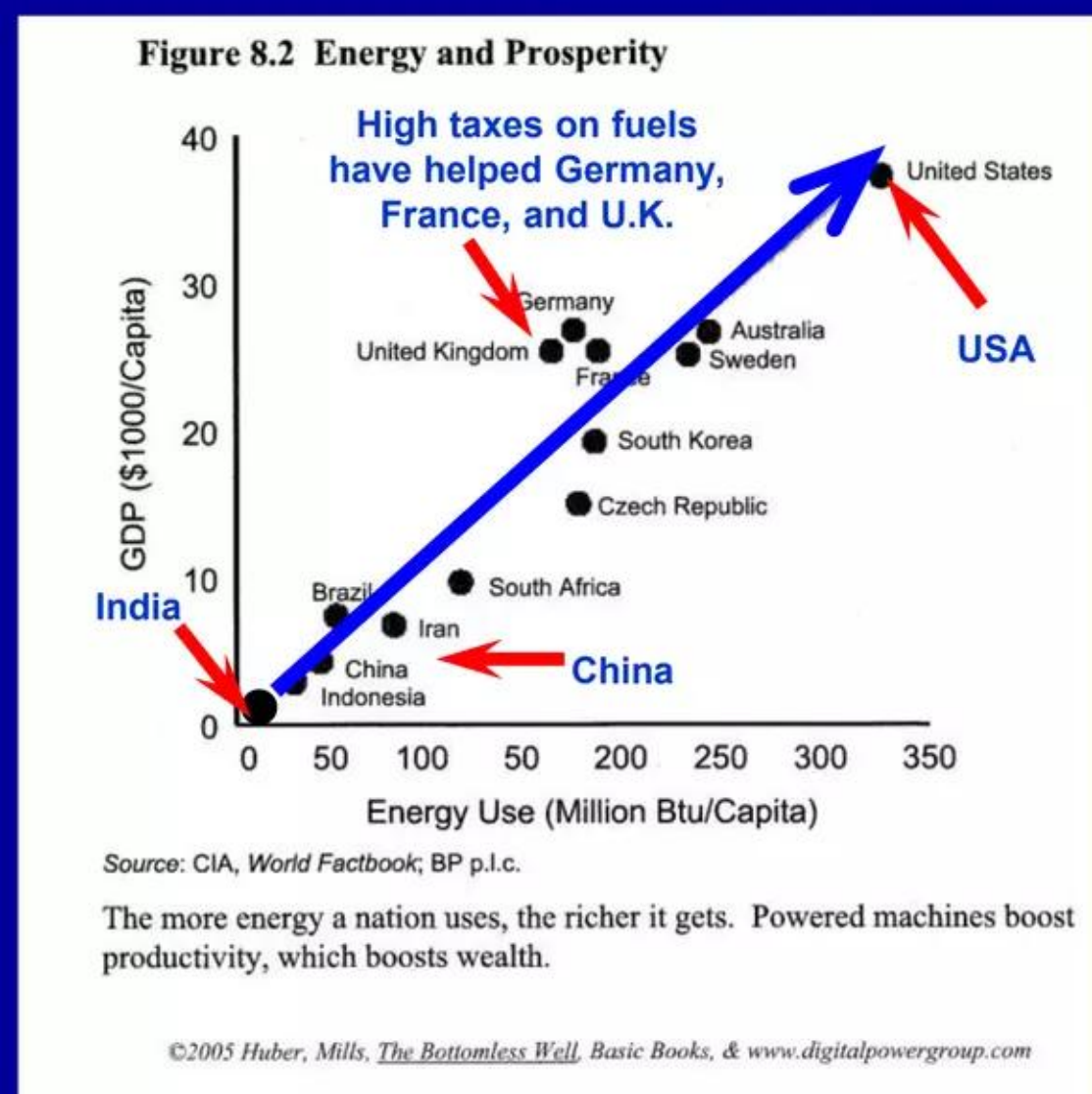


Fig. 1, pp. 20, Brown et al., “The relationship between per capita energy use and per capita gross domestic product (GDP; in US dollars), plotted on logarithmic axes, from 1980 to 2003.”

**From:** “Energetic Limits to Economic Growth”  
J. Brown et al.  
*BioScience* 61 pp. 19 - 26 (January 2011)

<http://www.aibs.org/bioscience-press-releases/resources/Davidson.pdf>



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## New data discussed in recent must-read articles

*Support idea of unexpectedly rapid deceleration in global population growth*

*“The Fertility Implosion”*

David Brooks, Columnist

*The New York Times*, op-ed pages

March 12, 2012

<http://www.nytimes.com/2012/03/13/opinion/brooks-the-fertility-implosion.html>

Selected excerpts from Brooks’ NYT article (quoting directly):

“When you look at pictures from the Arab spring, you see these gigantic crowds of young men, and it confirms the impression that the Muslim Middle East has a gigantic youth bulge — hundreds of millions of young people with little to do. But that view is becoming obsolete. As Nicholas Eberstadt and Apoorva Shah of the American Enterprise Institute point out, **over the past three decades, the Arab world has undergone a little noticed demographic implosion. Arab adults are having many fewer kids.**”

“Usually, high religious observance and low income go along with high birthrates. But, according to the United States Census Bureau, **Iran now has a similar birth rate to New England — which is the least fertile region in the U.S.**”

“**The speed of the change is breathtaking. A woman in Oman today has 5.6 fewer babies than a woman in Oman 30 years ago. Morocco, Syria and Saudi Arabia have seen fertility-rate declines of nearly 60 percent, and in Iran it’s more than 70 percent. These are among the fastest declines in recorded history.**”



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<http://www.nytimes.com/2012/03/13/opinion/brooks-the-fertility-implosion.html>

Selected excerpts from Brooks’ NYT article (quoting directly):

“If you look around the world, you see many other nations facing demographic headwinds. If the 20th century was the century of the population explosion, the 21st century, as Eberstadt notes, is looking like the century of the fertility implosion ... “Already, nearly half the world’s population lives in countries with birthrates below the replacement level. According to the Census Bureau, the total increase in global manpower between 2010 and 2030 will be just half the increase we experienced in the two decades that just ended.”

“Even the countries with healthier demographics are facing problems. India, for example, will continue to produce plenty of young workers. By 2030, according to the Vienna Institute of Demography, India will have 100 million relatively educated young men, compared with fewer than 75 million in China ... But India faces a regional challenge. Population growth is high in the northern parts of the country, where people tend to be poorer and less educated. Meanwhile, fertility rates in the southern parts of the country, where people are richer and better educated, are already below replacement levels.”

“The U.S. has long had higher birthrates than Japan and most European nations. The U.S. population is increasing at every age level, thanks in part to immigration. America is aging, but not as fast as other countries ... But even that is looking fragile. The 2010 census suggested that U.S. population growth is decelerating faster than many expected.”

“For decades, people took dynamism and economic growth for granted and saw population growth as a problem. Now we’ve gone to the other extreme, and it’s clear that young people are the scarce resource. In the 21st century, the U.S. could be the slowly aging leader of a rapidly aging world.”



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*Support idea of unexpectedly rapid deceleration in global population growth*

*“Fertility Decline in the Muslim World: A Veritable Sea-Change, Still Curiously Unnoticed”*

N. Eberstadt & A. Shah

*The American Enterprise Institute*

*Working Paper Series on Development Policy*

Number 7, December 7, 2011

[http://www.aei.org/files/2011/12/19/-fertility-decline-in-the-muslim-world-a-veritable-seachange-still-curiously-unnoticed\\_103731477628.pdf](http://www.aei.org/files/2011/12/19/-fertility-decline-in-the-muslim-world-a-veritable-seachange-still-curiously-unnoticed_103731477628.pdf)

Selected excerpts from Eberstadt & Shah’s working paper (quoting directly):

“There remains a widely perceived notion - still commonly held within intellectual, academic, and policy circles in the West and elsewhere - that Muslim societies are especially resistant to embarking upon the path of demographic and familial change that has transformed population profiles in Europe, North America, and other, more developed areas (UN terminology). But such notions speak to a bygone era; they are utterly uninformed by the important new demographic realities that reflect today's life patterns within the Arab world, and the greater Islamic world as well.”

“Throughout the *Ummah*, fertility levels are falling dramatically for countries and sub-national populations --- and traditional marriage patterns and living arrangements are undergoing tremendous change. This brief note will highlight some of these changes, examine some of their correlates and possible determinants, and speculate about some of their implications.”



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Selected excerpts from Eberstadt & Shah’s working paper (quoting directly):

**“Some Implications of Today’s Rapid Fertility Declines in the Islamic World:**

**“We have made the empirical case in this chapter that a sea-change in fertility levels, and by extension, in attendant patterns of family formation, is now underway in the Islamic world - even if this sea-change remains curiously un-recognized and un-discussed even in the societies it is so rapidly transforming. Why this should be the case is an important question, but one that will not detain us here. Instead, we shall conclude by touching a few of the more obvious implications of these big demographic changes for the years ahead.”**

**“1) Downward Revision of Population Projections: In its 2000 revisions of World Population Prospects, UNPD - medium variant projections envisioned a population for Yemen of 102 million people; in its 2010 revisions, the 2050 - medium variant projection for Yemen is 62 million. (USCB projections for Yemen for 2050 as of this writing are even lower: under 48 million.) Unanticipated but extremely rapid fertility declines would likewise militate for downward revisions in the trajectory of future demographic growth in other Muslim-majority areas.”**



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*Support idea of unexpectedly rapid deceleration in global population growth*

*“Is the United States population heading for long-term deceleration”*

R. McChesney & D. Overberg

*NewGeography.com*

March 6, 2012

<http://www.newgeography.com/content/002705-is-the-united-states-population-heading-long-term-deceleration>

Selected excerpts from McChesney & Overberg's online article (quoting directly):

**“It's been clear since the census 2011 estimates were released on December 21, 2011, that we are experiencing something of a demographic change, at least in the short run. Clearly growth is slowing down in part, many believe, due to economic reasons, as was the case during the 1930s as well as the 1970s.”**

**“But there may be a series of other of causes of recent population change which suggest it is quite possible the United States population is simply heading towards zero population growth far quicker than the Census had previously estimated. One key reason may be the slowdown in immigration. Whatever the cause, if these patterns are not reversed, we could start observing European like slow rates of population growth spreading in the next couple of decades.”**



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Selected excerpts from McChesney & Overberg's online article (quoting directly):

“These numbers are, of course, just one year and it is entirely possible that growth will rise as the economy improves and as the current large millennial generation enters their prime child bearing years. But if the current one-year trend becomes a longer term phenomena, we could see a possible leveling off of population much sooner and at a lower rate than forecasted, say around 360 million by mid-century instead of 478 million by the year 2100 as forecast by the United Nations Population Division. These, will have implications for government fiscal policy, and will generate debate about government policy in encouraging births as we observe in Europe, Russia and Japan. Population growth has been a relative advantage for the United States and remains so, but we may have to consider whether this trend is inexorable.”



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## Final comments:

*Today's higher oil prices are the direct result of strong GDP growth in key countries*

**“The comparatively recent surge in energy prices has only a little to do with terrorist activity and politico-military instabilities in the Middle East. In fact, it mostly results from relatively unrestricted trade in energy sources between countries; heavily arbitrated global energy markets; significantly increased rates of economic growth in many parts of the world; as well as overall improvement in living standards and increased per capita disposable income in many countries.”**

**“India and China are especially important consumers of energy because they comprise nearly 40% of the world's population. They now also have the financial resources to buy whatever energy they need on the open market, in direct competition with older industrialized energy-importing nations such as the European Union, Japan, and the US. This has intensified competition for energy supplies and has been a major factor in the acceleration of energy price inflation that has occurred during the past several years.”**

**“The overwhelming dominance of carbon-based energy sources as a % of current global energy consumption has simple underlying economic reasons: even with recent price increases, oil, coal, natural gas, and other carbon-based fuels are among the least expensive, most readily available, most economically and technologically fungible energy sources that exist on the planet today. The overwhelming dominance of fossil fuels and their continued price competitiveness is a key aspect of the global energy ‘supply problem’ over the next 50 years.”**

***“For the balance of the 21<sup>st</sup> century, reducing the effective price and increasing the availability of readily usable, new sources of energy, while at the same time reducing emissions of CO<sub>2</sub> into the atmosphere, are the keys to sustainable economic growth and continued widespread global improvement in the standard of living”***

Lattice private report, August 29, 2011, pp. 34



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**“In ten years all important animal life in the sea will be extinct. Large areas of coastline will have to be evacuated because of the stench of dead fish.”**

**Paul Ehrlich, Earth Day 1970**  
**Author of 1968 book, “The Population Bomb”**