A pragmatic market perspective on the cornucopian and neo-Malthusian environmental debate advanced by the Julian Simon and Paul Erhlich wager

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Abstract

The purpose of this paper is to explore the debate between neo-Malthusians and Cornucopians as reflected in the wager made by Julian Simon noted conservative economist author of The Ultimate Resource and Paul Erhlich author of The Population Time Bomb. The paper reprises the original bet but adds a moving average methodology in considering the 30 year fluctuation in the price of a basket of five base metals. The paper also explores Simon's thesis on human inventiveness as the solution to mankind's needs and the neo-Malthusian counter arguments that resources as well human inventiveness are finite.

Keywords: Cornucopian, Neo-Malthusian, finite, technological Dark Ages, metals, patents, sustainability

Introduction

The purpose of this paper is to explore the debate between Cornucopians and Neo-Malthusians using the original Simon and Erhlich global sustainability wager of 1980. In this paper the philosophic underpinnings of the Cornucopian and Neo-Malthusian viewpoints are examined and made relevant to the Simon and Erhlich wager and debate in the 21st century.

The theory of depletion and scarcity is well stated in this Paul Erhlich quote "In the early 1970's, the leading edge of the age of scarcity arrived. With it came a clearer look at the future revealing more of the nature of the Dark Ages to come." The proponents of this Malthusian vision of a world limited by finite resources and surging population growth paint a dark vision of the world's future from their vantage point in 1970's an era of economic malaise and oil embargos. However, not everyone shared this gloomy perspective on mankind's fate and an alternative view of the world's future emerges in the writings of what are called the derisively by some the "Cornucopians". This debate crystallized in the bet made between Paul Erhlich noted environmentalist and author of the Population Time Bomb and acclaimed conservative economist Julian Simon author of the The Ultimate Resource. Julian Simon's "cornucopian" perspective is neatly represented in this passage from his book "The school of thought that I represent here is not cornucopian. I do not believe that nature is limitlessly bountiful. I believe instead that the possibilities in the world are sufficiently great so that with the present state of knowledge, and with additional knowledge that the human imagination and human enterprise will develop in the future, we and our descendants can manipulate the elements in such fashion that we can have all mineral raw materials that we need and desire at prices ever smaller relatives to other prices and to our total incomes. In short, our cornucopia is the human mind and heart, and not a Santa Claus natural environment. So it has been in the past, and so it is therefore likely to be in the future. It is from this dialectical view of the world that Julian Simon challenged Paul Erhlich to a decade long bet "This is a public offer to stake $10,000…on my belief that mineral resources (or food or other commodities) will not rise in price. If you are prepared to pay me the market price for $1000 or $100 worth of any mineral you name (or other raw material including grain and fossil fuels) that is not government controlled. I will agree to pay you the market price of the same amount of that raw material on any future date you specify."

Each of these "gamblers" had underpinning their bet a genuine belief that their view of the world was the accurate one with Erhlich viewing the world through the prism of over-population, finite resources, negative entropy and demand for the earth's resources outstripping the earth's supply. Simon's perspective was based on an abiding faith in the ingenuity of man and ability of the trajectory of technology to resolve the needs of mankind. (It should be noted that Simon had in his pocket the knowledge that for over a century or more the price of metals had been declining in real terms and thus for him the bet posed little risk of failure) The actual bet was made on a basket of metals comprised of chrome, copper, nickel tin and tungsten and the timeframe of the bet was 1980 to 1990. In 1990 at the conclusion of the bet, the basket of metals purchased at $1000 was now worth less and Erhlich sent Simon a check for the difference of $567.07. (Tierney 1990) Despite this demonstration of the laws of supply and demand the debate between Malthusians and Cornucopians rages on to this day.

In the literature it becomes apparent that the Cornucopian view would be characterized as optimistically confident in the solutions that technologies will offer to address mankind's needs and solve its problems. While the Neo-Malthusian perspective would be regarded as pessimistically "***realistic"*** in its view of the limits of mankind's growth and its ability to solve

resource problems with technology. A key point is found in two words that perhaps are interchangeable one word is resources and the other word is solutions. From an environmental perspective the word resource refers to exhaustible materials found on and in the earth that are extracted by mankind to address its need for products. The word exhaustible is key term as well as it references a finite amount of resources which can only support a limited population on earth. The word solution is important from a market and marketing context as it references the addressing of human need through the solution that the product provides. The Malthusian viewpoint uses the terms finite and exhaustible to advance their perspective that the earth's population should be limited that conservation and limits to economic growth are necessary to save the planet. "We are shipped wrecked passengers on a doomed planet. Yet even in a shipwreck human decencies and values do not necessarily vanish, and we must make the most of them. We shall go down, but let it be in a manner to which we may look forward as worthy of out dignity." The Cornucopian view point emphasizes that mankind and its human population is part of the earth's eco-system and not an exogenous or pernicious presence on the earth. Simon views increases in the world's population as a solution in and of itself as he believes that it is from these new minds that new ideas, technology and solutions to mankind's need will emerge. It is Simon's view that it is scarcity when it does emerge drives technological innovation and solutions to the scarcity that will restore the price equilibrium to the market system. Simon believes that the range of solutions to mankind's needs are infinite not because the earth's resources are inexhaustible but because of man's inventiveness, ingenuity and capacity for finding substitutes. The Malthusian perspective is based on limits, finite boundaries to resource reserves and that "entropy will continue to decrease rather than increase in the human environment" in the closed eco-system of the Earth.

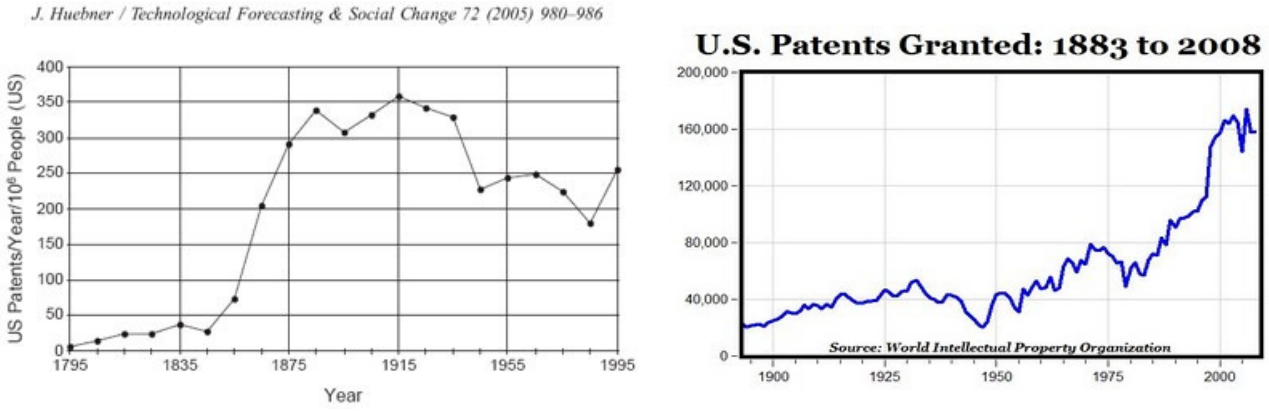
Simon counters this point of view with the chart below that shows that the known reserves of raw materials of every form imaginable has increased over the centuries not declined and he argues that we actually don't know the total available resources as they are yet undiscovered. Simon finds support for this view of the growing abundance of natural resources from Kahn, Brown and Martel in their table for U.S. Bureau of Mines, Minerals Commodities Summary, 1990.

Natural Resource Reserves 1950-1990

Resource	1950	1990	Change %
Bauxite	1400	21,500	1,436%
Chromium	70	420	500%
Copper	100	350	250%
Iron Ore	19,000	145,000	663%
Lead	40	70	75%
Manganese	500	980	96%
Nickel	17	59	247%
Oil	104	1002	863%
Tin	6.0	4.2	-30%
Zinc	70	145	107%

Kahn, Brown and Martel in their table for U.S. Bureau of Mines, Minerals Commodities Summary, 1990.

Malthusian's not content with the argument that the earth's resources are measurable, finite and exhaustible also advance the argument that mankind's inventiveness is also exhaustible and they use a combination of patent rates and population increases to argue the case that we are facing an impending ***technological "Dark Ages"*** looming in the not to distance future of 2030.



Above are two charts depicting each side of the technological solution argument on the left you have Jonathan's Huebner's chart from his paper **"A Possible Declining Trend for Worldwide Innovation** in the Journal of Technological Forecasting and Social Change that shows patent rates declining as the population rate increases. Huebner's chart advances the Malthusian view that even as populations grow the level of inventiveness and creativity appears to decline. The chart on the right shows a more Cornucopian perspective with patents granted increasing five-fold since 1900. This Malthusian perspective is best summed up in a quote from Huebner ***"The rate of innovation peaked in the year 1873 and is now rapidly declining. We are now at an estimated 85% of the economic limit of technology, and it is now projected that we will reach 90% in 2018 and 95% in 2038.*** (Huebner 2005) The argument of the neo-Malthusian's regarding both natural resources and humankind's levels of inventiveness are based on their ability to predict the quantity of natural resources present in the earth's crust and also to project the ingenuity of as yet unborn generations of people who will seek solutions to their market needs as generations past have done with success. Huebner punctuates this view with the prediction that by 2024 ***"We are approaching the "dark ages point" when the rate of innovation is the same as it was during the Dark Ages….we will reach that in 2024."*** (Huebner 2005) The fundamental flaw in both of the neo-Malthusian arguments is one of ***"bounded rationality"*** in other words here is the information that we have albeit imperfect, flawed or insufficient but let us make public policy and social engineering decisions with as it is the only information that we have available.

Huebner's coupling of human population to the world patent rate is readily embraced by neo-Malthusian as it allows them to counter Simon's argument that human needs will be solved by human inventiveness with the chart clearly showing a negative trend line of inventions to human population. Cornucopian's would likely counter that using human population increases to show a declining rate of inventiveness is a flawed argument as it fails to acknowledge that technological advances in medicine, science, and agriculture are the reasons that human living conditions have improved and the population has increased. Additionally, the theorists of Singularity Theory would argue that inventions created by machines would not be reflected in the historical patent rate that Huebner employs for advance his looming ***technological "Dark Ages"***. Huebner finds

support from Theodore Modis a Swiss physicist and futurologist in his argument that technology and creativity will experience decline in the 21st century. Modis sets his point of decline beginning in 1990 and envisions a long slow decline throughout the 21st century. But futurologist are not of one mind when projecting the future of human inventiveness John Smart at the Acceleration Studies Foundation finds that we are rocketing toward what is called ***"technological singularity…a point sometime between 2040 and 2080 where change is so blindingly fast that we just can't predict where it will go. Eric Drexler founder of nano technology shares this view "it will only be a matter of time before nano engineers will surpass that which cells do, making possible atom by atom desktop manufacturing….the resulting advances seem well above the curve that Dr. Hueber projects."*** (Drexler 2005)

This discussion regarding the finite or infinite nature of things brings the discussion directly back to the Simon and Erhlich bet and the intuitive conclusion that if a resource is finite and demand increases then one should see a significant increase in the value of the resource over time. In a redux of this bet by Fitzpatrick and Spohn in their paper, **A 25th Anniversary Redux of the Simon and Erhlich Global Sustainability Wager,** the same $1000 basket of metals over a 25 year period was worth only $736.84 in inflation adjusted dollars which represented a 26.3% decline from 1980 to 2005. In Table 1 you are able to see the individual performances of the basket of metals over the ten year period of the bet and then over the twenty-eight year period of the redux of the bet.

Table 1: Percentage Change in Commodity Price (1980$/unit)[a]

Commodity[b]	Percent change 1980-1990 (%)	Percent change 1990-2000 (%)	Percent change 1980-2000 (%)	Percent change 2000-2008 (%)	Percent change 1980-2008[c] (%)
CHROMIUM	-11.9	-35.3	-42.9	266.8	109.4
COPPER	-23.3	-45.7	-58.4	190.2	20.8
NICKEL	-10.3	-26.0	-33.6	95.3	29.6
TIN	-71.3	-27.3	-79.1	144.1	-49.0
TUNGSTEN	-71.1	-25.8	-78.6	238.6	-27.4

[a]Commodity prices were converted to real prices in 1980 dollars using Bureau of Labor Statistics annual Consumer Price Index. Retrieved June 21, 2010 from http://data.bls.gov/cgi-bin/surveymost

[b]U.S. Geological Survey Data Series 140. Retrieved June 21, 2010 from http://minerals.usgs.gov/ds/2005/140/

[c]2008 was the most current annual price data available through the U.S. Geological Survey Data Series 140.

Thirty year estimates are available on selected metals using a central moving average of IMF monthly data series. Thirty year estimates evidence similar trends. For example, annual price changes for the entire decade from 2000-2010 for copper, nickel, and tin were 221.71%, 103.14% and 156.88% respectively.

Commodity prices are dependent on both macroeconomic and microeconomic events. Prior to 2000, metal commodity prices included in the Ehrlich and Simon bet were on a long term downward trend. In 2002, metal prices, in general, began an increase that would continue through the first half of the decade. Macroeconomic forces like strong global growth especially infrastructure development in China increased global demand for metals and drove up prices. (IMF 2006)

As Table 2 indicates, the dollar amount of the basket of metals would have changed dependent on which decade was chosen. Kiel, Matheson, and Golembiewski (2010) examined the past 109 years of price data and found that Ehrlich and not Simon would have won more of the bets.

Table 2: 1980 Dollar Values of Original Ehrlich and Simon Commodity Basket at 10 Year Intervals

	Commodity Values in 1980[a] (1980 $)	**Commodity Values in 1990[b] (1980 $)**	**Commodity Values in 2000[c] (1980 $)**	**Commodity Values in 2008[d] (1980 $)**
CHROME	200.00	176.20	114.20	418.80
COPPER	200.00	153.40	83.20	241.60
NICKEL	200.00	179.32	193.17	259.20
TIN	200.00	56.00	57.50	102.00
TUNGSTEN	200.00	86.00	57.80	102.00
TOTAL	1000.00	650.92	505.87	1123.60

[a] The original $1000 basket of the Ehrlich & Simon commodity basket included chrome, copper, nickel, tin, and tungsten.

[b]Commodity values in 1990 are the product of the original $200 investment by Ehrlich and Simon and the 1980-1990 respective growth rate of the commodity price value.

[c]Commodity values in 2000 are the product of the original $200 investment by Ehrlich and Simon and the 1980-2000 respective growth rate of the commodity price value.

[d]Commodity values in 2008 are the product of the original $200 investment by Ehrlich and Simon and the 1980-2008 respective growth rate of the commodity price value.

Individual commodities are subject to microeconomic aspects and specific supply and demand. For example, tin recorded a decline in value from $200 to $56 from 1980 to 1990. This short term decline was the result of the collapse of the International Tin Agreement (ITA). The ITA attempted to stabilize tin prices by using stockpiles to adjust supply. The ITA collapsed in 1985 and tin prices fell. As a result tin prices reached their lowest levels in the latter half of the 1980s. (U.S. Geological Survey 1998) Similarly, in the most recent decade chromium prices reached highest levels. This increase was fueled by China's growth particularly in its production of stainless steel. (U.S. Geological Survey 2009) If chromium was removed from the wager above, Simon would have continued to win the bet in the latter period but the payoff would have been smaller.

The Ehrlich and Simon bet did not resolve their differences but brought a great deal of attention to the debate. A second bet with a different choice of commodities was suggested but never considered. Would it have made a difference? To reduce industry sensitive issues, consider the results of key commodity indices in Table 3. Edibles index versus the industrial inputs index performed opposite during the decade of the actual bet. The results of the Ehrlich

and Simon bet would have been different had they chosen the components of the edibles index instead. In the following decades, however, commodity index choice was irrelevant for the most part. Had the bet been reinstated in 1990 or 2000, the results would have been similar despite the index chosen.

Table 3: Percentage Change in Commodity Index (2005$)[a]

	Percent change[b] 1980-1990 (%)	**Percent change 1990-2000 (%)**	**Percent change 2000-2010 (%)**	**Percent change 1980-2010 (%)**
Index of Fuel and Non Fuel Commodities	NA	NA	128.90	NA
Index of Non-Fuel Primary Commodities	-6.88	-15.45	79.51	41.34
Edibles Index	-21.07	-20.39	76.49	10.90
Food Index: Cereals, vegetable oils, protein meals, meats, seafood, sugar, bananas and oranges	-17.34	-21.01	71.88	12.23
Index of Beverages, Coffee, Cocoa, and Tea	-47.34	-13.54	123.07	1.56
Index of Industrial Inputs	18.80	-9.52	82.70	96.39
Index of Agricultural Raw Materials	42.69	-3.24	19.36	64.79
Metals index	1.87	-15.74	154.89	118.77
Commodity Fuel (energy) Index, 2005 = 100, includes Crude oil (petroleum), Natural Gas, and Coal Price Indices	NA	NA	171.54	NA

[a] International Monetary Fund Primary Commodity Prices. Retrieved June 15, 2010 from http://www.imf.org/external/np/res/commod/index.asp

[b] Percent changes are based on a twelve month centered moving average of the IMF monthly data series.

Conclusions

The findings of this paper on the 30th Anniversary of the Simon and Erhlich wager will do little to resolve the debate between Cornucopians and Neo-Malthusians. Results of this iteration of their wager are at best mixed with Chrome's surge in price based on the distortion of the Chinese economic infrastructure demands giving Erhlich the win. Simon would argue that it is the Chinese government influence not markets influences that caused the wager to be lost and Neo-Malthusians would claim that their point is won by the overall price increase in the metals for the first decade of 21st century was in their favor. In fact if Chrome is removed from the basket then Simon would indeed win the bet for a third time giving Cornucopians additional ammunition for

their arguments. The debate regarding the finite nature of natural resources and their exhaustibility needs to be examined by experts in the field of mining and mineralogy and futurologists need to continue the debate and explore the limits of human inventiveness and the likelihood of our entering a ***"technological Dark Ages."*** If asked to place a wager the authors would likely bet on the Cornucopians more optimistic view of the world.

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