

Living a Lie

Stripped of its financial make-up, the economy is not as it first appears



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Introduction

The sheer size of the 2007 and 2008 financial crisis took a lot of people by surprise. Central banks responded with huge amounts of liquidity. Industries were nationalised and the government became the buyer of last resort; private sector financial engineering was replaced with public sector printing of money. There has been a large amount of public anger and political point-scoring directed at bankers and their greed for getting us in this mess, but whilst they were at the eye of the storm, were they really to blame? There has been no in-depth analysis of what had really gone on. Economists at large clearly had no inkling that there was any problem in the run-up to the crisis and their subsequent backtracking has still failed to look beyond the obvious and understand the root cause.

The economics profession, as it stands, is bankrupt, sticking to rules laid out in textbooks many years ago without understanding the implications. Go to any presentation by an economist and they will show you a chart of US debt growth relative to GDP, but I can assure you that not one of them will observe that if debt is rising relative to GDP over time, then by definition capital is being misallocated and that productivity is effectively being taxed. An understanding of this simple truism could have stopped the crisis happening, but instead we were fooled by the illusion of paper wealth and turned a collective blind eye to the imbalances that were being built and the inevitable consequences.

Four years on, the level of anger has subsided as government and central bank policy has returned a level of apparent stability to most economies. Following familiar economic “wisdom” governments have taken on the role of replacing private sector borrowing with public sector borrowing. They have replaced private sector monetary expansion with public sector monetary expansion. Too afraid to allow the economies to rebalance and cleanse themselves of excesses, they have simply compounded the unsustainable imbalances, hoping to put-off the eventual day of reckoning. So long as the economy is not in free fall, households have by and large accepted the adjustment to their standard of living and carried on oblivious to the growing pressures within the system.

The mantle of debt growth, which was passed from the U.S. government in the 1990’s to the government sponsored entities of Fannie Mae and Freddie Mac, and then on to the private sector where household debt grew by USD1 trillion dollars a year for six years, has since come full circle with the US government running an annual budget deficit of 8.4% GDP (30th June 2011). As the imbalances have grown and continue to strangle the economy, China has also taken up a leading role in fighting the inevitable economic convulsion, lifting its on-and-off-balance sheet debt 61% in excess of GDP over the last 4 years alone to 185% GDP according to the ratings agency Fitch. It is highly unlikely that such an aggressive mobilisation of resources in such a short period of time will ever make a positive return. The misallocation of capital therefore continues and the bubble of unsustainable debt gets ever bigger.

I am often described as a bear, seeing the glass as half empty rather than half full. I see it totally differently. The world has accepted an increasingly underperforming economy for many years and rather than backtracking, it continues to go down the same Keynesian path to an ever slower economy supported by ever greater imbalances and ever greater misallocation of capital. I am frustrated therefore that we are getting much less out of life than we should be. By taxing productivity as politicians are doing, they are condemning us to a lower standard of living than we could have. As it turns out this policy is also to blame for the widening gap between the rich and the poor. It should be no surprise that government measures of GDP do not coincide with measures of happiness when “toil

indices” suggest that we have to work many more hours to get the same basic goods as we did 40 years ago.

Those of you familiar with my work will know me best for my interest in the energy market. Last year I issued a report *Global Exhaustion* which suggests that the geological barriers to fossil fuel production is significantly outpacing our technological advancement of extraction, and that consequently to maintain the net supply of energy, more of the economy’s output is having to be diverted towards energy production leaving less capital for end consumption. My own figures suggest that over the next 10 years the cost of energy production will have risen from 5% of the world economy to 20%, squeezing out other industries. The International Energy Agency (IEA) is slightly less pessimistic, but nevertheless calculates that USD38trn will have to be spent on energy production between now and 2035, up from its 2010 estimate of USD33trn. That USD5trn increase alone is equivalent to a real 1.3% per annum compound tax hike on the world’s largest economy, the United States of America. Using my own estimates rather than the IEA’s, the compound tax increase over the next 10 years is equivalent of 1.7% per annum on the world economy as a whole.

Why did US debt become unsustainable in 2007/08 when it was not in 2005 or 2006? Fed governor Bernanke had already laid his cards on the table in 2002 in his infamous helicopter speech. He had said that under a fiat monetary system the Fed could always avoid deflation simply by issuing more money and standing as the lender of last resort. Either the Federal Reserve, and other central banks around the world were asleep on the job or the crisis was more fundamental than the shortfall of funds at banks suggested. The crisis was not a monetary problem at all. The economy simply buckled under the tax hike of higher resource prices, which meant the mountain of debt could no longer be serviced.

The contraction in global GDP that followed allowed a small cushion of resource inventories to be built thereby allowing the economy to find a temporary base. Without addressing the bottlenecks in energy supplies however, the process will keep repeating itself, squeezing out the marginal consumer. No matter how much monetary oxygen the central banks provide, or how much government tries to create end demand with fiscal stimulus, the global economy will gradually be strangled by the resource constraint. Policy that compounds the misallocation of capital ends up lowering the stall speed of the economy.

The focus of this report is not to look at the energy market or the impact it is having on the economy and therefore our standard of living, but rather to ask why we are in this mess. Have we reached a technology frontier that means we are consuming down our balance sheet and thereby living beyond the capacity of the Earth as some people suggest with absolutely dire consequences, or is our present predicament simply the result of the cumulative misallocation of capital over many years? We know full well that nuclear fusion is the solution to the resource constraint, but is it technically beyond us or is there another reason why we have not yet achieved it? And if we have not yet managed nuclear fusion, what other areas of technology are we lacking in?

Are the protestors around the world right to be blaming the failure of capitalism? In this book I hope to explain that the technology shortfall is an economic and political failure rather than a genuine scientific barrier. The 2007/2008 financial crisis, the increasing frequency of global economic retracements, and the deteriorating medium and long term economic outlook was never a failure of capitalism. Quite the contrary, it was always a consequence of government policy of taxing productivity in favour of social transfers. The gradual dumbing down of capitalism and move towards social democracy over the last 50 years relied on building a Ponzi scheme of financial innovation to keep the illusion alive.

Despite protestations by anti-capitalists we have reached a point of no return. In the short to medium term the global economy is going to lurch from one crisis to the next, but this will gradually lead to a dismantling of the old political and economic architecture and a much freer system going forward. It has to. There is simply nothing the government can do to prevent this happening. Printing more money or greater fiscal transfers will only accelerate the collapse. The Keynesian and fiat monetary experiment of the last 50 years in the West will go the same way as the similar but more extreme Communist experiment in the East. It will be a rough ride, but the prize at the end of it, a return to a proper freely functioning capitalist model, will make it all worthwhile, releasing the kind of Industrial Revolution and growth the West has not seen for 50 years.

Chapter 2. Sustaining Growth.

There is a broad understanding that China's economy is outpacing the West, and that if it can maintain its present pace of growth it will overtake the US to become the world's largest and potentially most powerful economy. Numerous books have been written on this subject and careers have been made describing the emergence of the East and the demise of the West. Based on simple extrapolation of the present trends there can be no argument, but without innovation and productivity it is equally certain that China simply does not have the resources or factors of production to fulfil that potential. In fact one particular measure of GDP, known as Green GDP, already suggests that China's economic growth has been about consuming down its own balance sheet over the last 20 years.

The 2011/12 Global Competitiveness Report issued by the World Economic Forum – (http://www3.weforum.org/docs/WEF_GCR_Report_2011-12.pdf) – suggests that China's competitiveness has indeed improved one place from 27th to 26th whilst the US had dropped from 4th to 5th. The ranking is not as simple as the headline suggests however as the Global Competitive Index (CGI) takes a country's stage of development into account by attributing higher relative weights to those aspects of the economy that are more relevant to its particular stage of development. In other words it measures the competitiveness against what it sees as its peer group, rather like a game of golf where people effectively play against their handicap rather than against other competitors. The direction of move is absolutely important, but it gives us no real insight into the relative positioning of the two economies.

The report looks at 12 different inputs or pillars of competitiveness, but within five stages of development; 1. Factor-driven, 2. Transition from factor driven, 3. Efficiency driven, 4. Transition from efficiency driven, and 5. Innovation driven. China was located in stage 3 and the US in stage 5, however it is not until the 2009/2010 report that China has moved from stage 2 to stage 3. Almost all of its growth has therefore been driven by factor mobilisation. Productivity has certainly improved as Western technology has been married up with cheap Asian labour, but for the moment at least, it has simply bought that productivity and know-how from the West, and paid for it by exploiting its own factors of production and its own resource balance sheet. To overtake the West China will have to learn how to innovate.

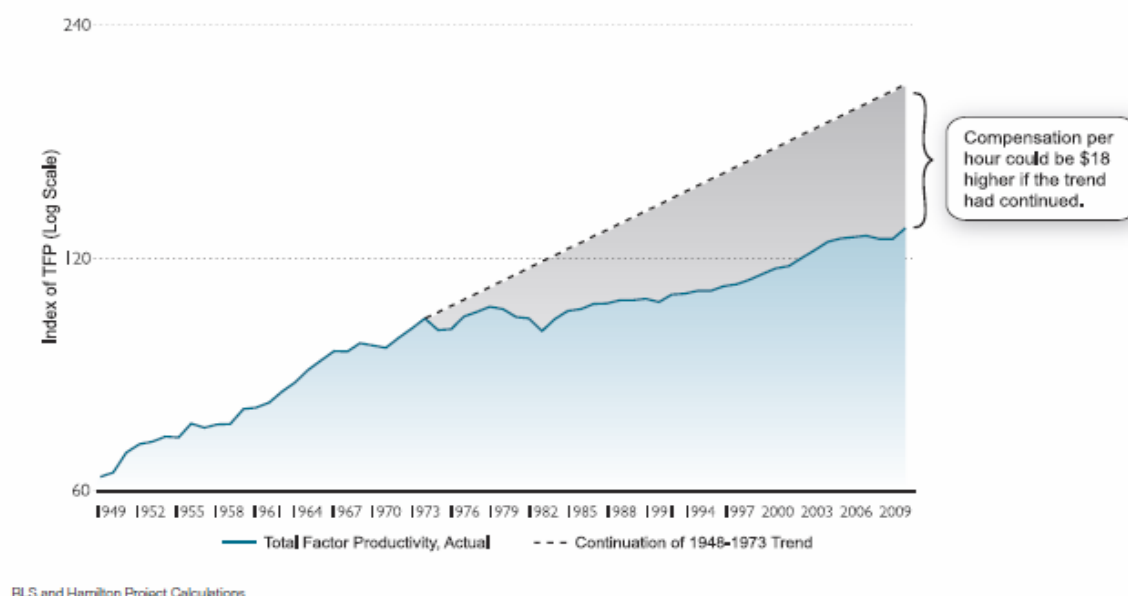
Stage 1: Factor-driven (37 economies)	Transition from stage 1 to stage 2 (28 economies)	Stage 2: Efficiency-driven (29 economies)	Transition from stage 2 to stage 3 (18 economies)	Stage 3: Innovation-driven (35 economies)
Bangladesh Benin Bolivia Burkina Faso Burundi Cambodia Cameroon Chad Côte d'Ivoire Ethiopia Gambia, The Ghana Haiti India Kenya Kyrgyz Republic Lesotho Madagascar Malawi Mali Mauritania Moldova Mozambique Nepal Nicaragua Nigeria Pakistan Rwanda Senegal Tajikistan Tanzania Timor-Leste Uganda Vietnam Yemen Zambia Zimbabwe	Algeria Angola Armenia Azerbaijan Botswana Brunei Darussalam Egypt Georgia Guatemala Guyana Honduras Iran, Islamic Rep. Jamaica Kazakhstan Kuwait Mongolia Paraguay Philippines Qatar Saudi Arabia Sri Lanka Syria Ukraine Venezuela	Albania Belize Bosnia and Herzegovina Bulgaria Cape Verde China Colombia Costa Rica Dominican Republic Ecuador El Salvador Indonesia Jordan Macdonia, FYR Malaysia Mauritius Montenegro Morocco Namibia Panama Peru Romania Serbia South Africa Suriname Swaziland Thailand Tunisia	Argentina Barbados Brazil Chile Croatia Estonia Hungary Latvia Lebanon Lithuania Mexico Oman Poland Russian Federation Slovak Republic Trinidad and Tobago Turkey Uruguay	Australia Austria Bahrain Belgium Canada Cyprus Czech Republic Denmark Finland France Germany Greece Hong Kong SAR Iceland Ireland Israel Italy Japan Korea, Rep. Luxembourg Malta Netherlands New Zealand Norway Portugal Puerto Rico Singapore Slovenia Spain Sweden Switzerland Taiwan, China United Arab Emirates United Kingdom United States

Frequent media claims that that China is pushing the US as a centre for innovation is factually wrong. Whilst China did file 203,481 patents in 2008 making it 3rd to Japan's 502,054 and the United States 400,769, over 95% of its patents were filed domestically, and were either "filer patents" for use of foreign inventions within the Chinese market, or were *innovations* that make only tiny changes to existing designs. In reality China accounted for less than 1% of those patents filed in each of the three leading patent offices, the US, Europe and Japan, and of those China-origin patents more than half were granted to subsidiaries of foreign multinationals. China accounts for 12% of world R&D spending so this may just be a matter of time, but for the moment the return on investment is minimal.

Unfortunately whilst the United States of America is in the 5th stage of development with growth driven principally by innovation, and it ranks as one of the very top in that segment, the simple reality is that its pace of innovation has slowed significantly over the last 40 years. The Brookings Institute's Hamilton Project published a paper *A Dozen Economic Facts About Innovation*, which highlights that since 1973 the pace of innovation in the United States of America, as measured by Total Factor Productivity (TFP) has collapsed from an annual increase of 1.9% to just 0.7%. If TFP had continued growing at the pre-1973 trend the economy would be 51% bigger than it is today, wages would have grown about 1.1% pa faster than they did, and by definition, the build-up of debt relative to GDP simply would not have happened. The stronger TFP growth is effectively just a measure of the better, or at least more productive, allocation of resources.

http://www.hamiltonproject.org/files/downloads_and_links/08_innovation_greenstone_looney.pdf

Total Factor Productivity



The Hamilton project admits that the main innovations of recent years have not been technological discoveries but rather ideas about how to reorganize businesses to make them more efficient. Over the last 20 years the big gains have come from organisational changes and economies of scale that allowed companies to streamline their supply chains, reducing the need to carry inventories. There is a limit to how far these gains can go, and to a large extent it is a matter of interpretation of whether these are efficiency gains at all, or are they simply removing layers of protection. The fact that Dell was able to slash its component inventories from 35 days cover in 1995 to just 6 days cover by 1999

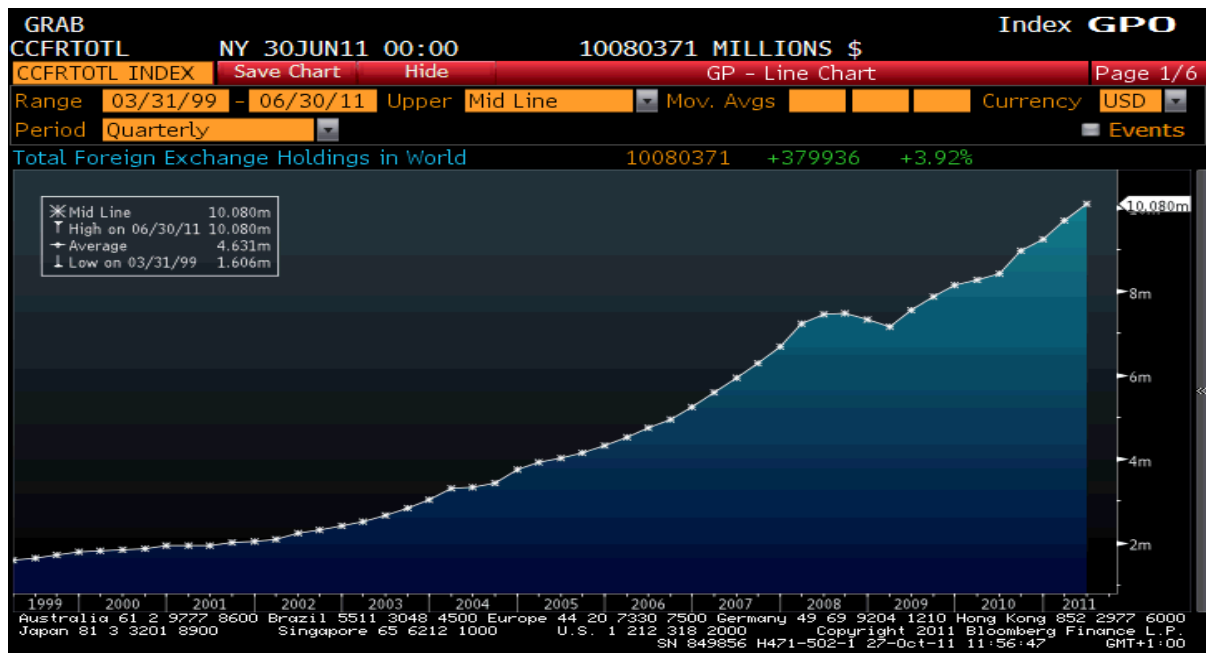
through better stock control has undoubtedly freed up its balance sheet, but as pointed out by the book *End of The Line*, it has opened industry to supply chain problems, the consequences of which have been seen in increased economic volatility and the resultant need for compensating monetary stimulus. The higher margin to Dell from reduced inventories was also a reduced profit to its suppliers. Unless Dell was going to increase its research and development budgets to compensate, it would actually mean reduced innovation, and reduced employment.

Breaking down processes into individual repeatable tasks actually makes innovation more difficult. Whilst specialisation and repeatability is the greatest strength of most businesses, it is also their greatest weakness. "Innovation is neither repeatable nor predictable; it is non-routine and uncertain", according to the book *The Other Side of Innovation*. Companies "non-stop quest for repeatability and predictability makes innovation out of reach. Striving too hard for perfect alignment kills innovation". Companies that benefit from battery-farm like efficiency will not have the ability to easily cross fertilise ideas.

The IMF explains the persistently low level economic growth in the developed world as simply due to limitations caused by the *Technology Frontier*. Advanced economies cannot grow quickly as their growth is about developing new technology and pushing the boundaries of possibilities whereas emerging markets are just exploiting existing technology. The IMF says the real wonder is not why the emerging markets are growing rapidly at the moment, but why they have taken so long to catch up. The answer is simply that with such slow productivity, the Western world is reliant on greater factor mobilisation, which means it has to exploit resources from the rest of the world. The very fact that we are not managing to advance this technology frontier has meant that we have increasingly had to turn to the emerging markets for their resources, but because we are not improving our technology sufficiently quickly, we are unable to exploit the emerging markets as perhaps we have done in the past; our productivity gap over them is narrowing rather than widening and so therefore is our wage differential. The resultant increase in competition from the emerging markets means that the resources are being consumed down that much more quickly. The end of the Cold War not only opened up cheap former communist labour to us, but more importantly their resources. Without technological innovation expanding our effective balance sheet, the only way to maintain growth was through exploiting other countries' reserves.

Financial innovation has filled the gap left by real innovation. It has allowed us to design ever more complex financial instruments to borrow the resources and factors of production from abroad and thereby maintain economic growth. Not only is this visible in terms of emerging market growth, but also in terms of the total worldwide foreign exchange reserves which have risen from USD1.78trn at the end of 1999 to USD10.08trn as of June 2011, reflecting the international borrowing. Unfortunately it can only ever be a temporary solution as it makes the economy far flatter or more horizontal and thereby consumes down resources more quickly. The current account deficits or global imbalances that economists and the media talk about are effectively imbalances between innovation or new technology and maintaining economic growth.

Total Foreign Exchange Holdings Worldwide



Without real innovation, we are running out of factors of production; we are consuming down the world's balance sheet and travelling ever closer to the Malthusian path. Whilst the US may have between 9.1% and 23% unemployment rate depending on which measure you chose to use, the simple fact is that there is no longer the energy to marry with those people to turn them into productive workers. There is no output gap. As this increasingly becomes the case, a lot of our so-called productivity gains will start to reverse. US real GDP today is still marginally below its peak of 2007 so whilst the productivity of those in work may have improved, the productivity of the country as a whole has clearly deteriorated. The rebound in US labour productivity statistics in the last 15 years, reflecting this financial innovation, would of course have been revised down if economic growth were to be adjusted for the trillions of dollars of subsequent losses the financial industry has taken.

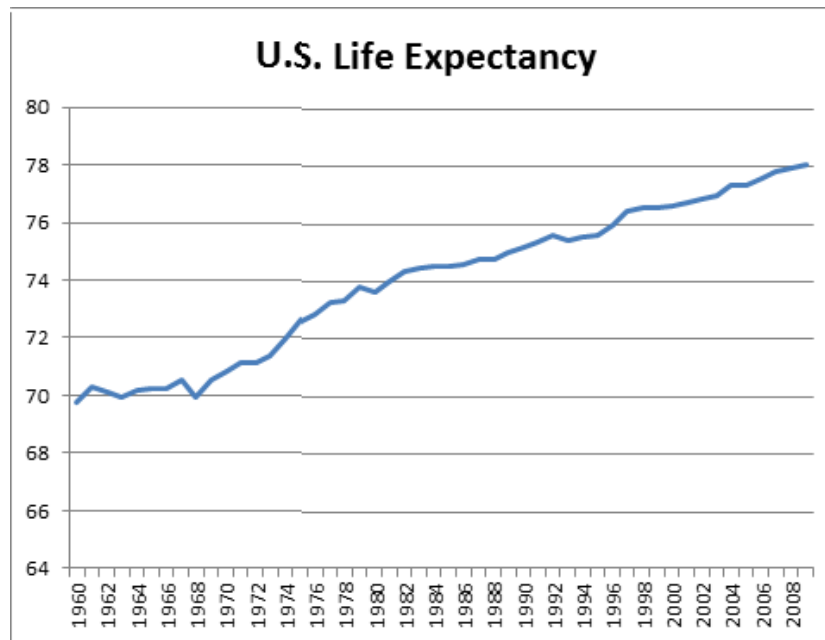
For a short period of time from about 1995 to 2004 US productivity growth improved to levels not seen for 20 years. More than 50% of the gain came from the wholesale and retail sector, generally thought to be the result of both better stock management and greater control over the supplier. Other sectors to see strong improvements were microprocessors and computer assembly due to a hedonic accounting treatment of Moore's Law, together with outsourcing, better inventory management and a reduced supply chain. The other big boost to productivity was from security brokers and the financial sector which benefited from "better risk management". Whilst it is easy to dismiss the big gains registered by these last two sectors from the list as due to nothing more than leverage, we should also strip the greater throughput that other industries benefited from as a result of the increased household leverage or apparent wealth. The retail sector productivity for example is only real if the household is able to maintain its elevated spending.

"If we look at measures of what economists call total factor productivity, growth has mostly been low since 1973. That is, we are innovating at a slower pace. We're relying more on people to work longer hours to get more output" according to Tyler Cowen, Professor of Economics at the George Mason

University. This means that growth has increasingly been dependent on factor mobilisation; not only labour but the other factor inputs. This may seem inconsistent with high US unemployment, but of course the high labour mobilisation has come from that embedded within imports, ie the tens of millions of jobs it has helped create in Asia and around the rest of the world. It has also come from high capital and resource consumption, all of which is reflected in the huge increase in debt:GDP. The very fact that the emerging markets are growing so rapidly relative to the developed economies, and the terms of trade are changing so heavily in favour of basic raw materials, again highlights a massive technology deficit to sustaining our present standard of living. The emerging market growth is being driven principally by this deficit, not the other way around.

The Global Competitiveness Report ranks Switzerland, Singapore, Sweden and Finland in that order as the top 4 innovative economies. Clearly Switzerland does have some of the world's leading pharmaceutical companies and is home to CERN, the European Organisation for Nuclear Research where the Large Hadron Collider is located, but that is experimentation not innovation. Similarly what does Singapore, Sweden or Finland offer? The report says "Finland moves up three places since last year to reach 4th position. Similar to other countries in the region, the country boasts well-functioning and highly transparent public institutions (3rd), topping several indicators in this category. It also occupies the top position in the higher education and training pillar, the result of a strong focus on education over recent decades. This has provided the workforce with the skills needed to adapt rapidly to a changing environment and has laid the groundwork for high levels of technological adoption and innovation". This may position it well to innovate, but in no way does it say it is innovating.

I'm sure we can all agree that one of the areas of scientific advancement over recent years has been pharmaceuticals, but if we look at this in more detail, it is not necessarily the positive to the economy that we think. Whilst we all want longer, healthier lives, unless we are also willing to work longer then the extension of our retirement is in reality a tax on the rest of the economy. As pensioners we are an unproductive asset and are consuming resources that could, in economic terms, be used better elsewhere. Perhaps this is one reason why Cornell University's economist Robert Frank calculates that the average US employee had to work 67 hours per month in 2000 to afford a median-price house in a decent school district compared with 41.5 hours per month in 1970 and 42.5 hours per month in 1950. To translate the economic benefit of the pharmaceutical advancement to the wider economy, the increased life expectancy has to be reinvested in a later retirement age. If not, our pensions will simply not be able to afford the longevity that existing technology can offer and our life expectancy will start to fall as happened with the former Soviet Union after its collapse.



World Bank, World Development Indicators

In a free market, the funding of the pharmaceutical advancement that has increased life expectancy would be a higher savings ratio. It would have naturally reflected excessive productivity over our immediate consumption needs and a preference to invest the spare factors of production in the future. As it is the US household savings ratio collapsed. The funding for the advancement came from under-investment in other aspects of the economy and selling capital and technology to other parts of the world. The savings or redirection of capital has come at the expense of amongst other things, a massive depletion in our technically and economically recoverable resource base. We have invested in the medical advancement that can extend our lives, but not in the resources necessary to afford that extension, and certainly not at its present standard of living.

The book *The Death of Demand* written by Tom Osenton suggests that there has been very little “discontinuous innovation” – the kind of innovation that produces totally new industries which themselves have spin-offs, and which drive new job creation - in recent years beyond the personal computer. Instead the only innovation we have had is “continuous innovation”; replacing record players with CD’s and then those with iPad’s etc. Unless the net result of the introduction of new categories is accretive to an economy, then it adds nothing to total growth and little to the capital stock of the country. With the time to reach innovation saturation also come down, itself a reflection of fewer competing new ideas and products, capital stock has a much shorter life expectancy than historically, and products are increasingly defined by fashion rather than innovation.

The Theory of Natural Limits says that every product has its own natural consumption rate, with a limit to how much of any one product people want. Every product experiences two major growth trends during its life cycle; an uptrend lasting about 20 to 25 years during which the rate of revenue or unit growth accelerates, and then a period in which revenue growth continually slows. While actual revenue growth continues, it does so at an ever decreasing rate. The inflection point, known as *innovation saturation*, is arrived at when the relative universe of customers for a particular product

has been established, at which point either cost-reductions or selling into other markets becomes the primary earnings driver. Every product goes through this, but US industry collectively went through innovation saturation in the 1970's. More industries are beyond the peak than not. Earnings had to be enhanced with corporate restructuring, synergy benefits and outsourcing. Innovation has been replaced with cost cutting. US economic growth fell from 4.44% in the 1960's to 3.26% in the 1970's, 3.07% in the 1980's, 3.11% in the 1990's and just 1.9% in the first decade of this century. A major study by the University of New Hampshire in 2005 confirmed this slowdown in revenue growth post the mid-1970's to be a matter of statistical fact. Line extensions and new products became less accretive to the economy. Earnings became increasingly defined by cost reductions; effectively deconstructing the infrastructure that had been built up in the preceding decades. (http://en.wikipedia.org/wiki/Innovation_saturation).

As corporates turned to cost cutting to offset the slowdown in revenue growth, accountants and business school managers replaced engineers and scientists. Spread sheets and cost management replaced passion and ideas. As the reward structure changed, education naturally reflected this, switching from maths and sciences to the arts and vocation. The economy adapts to the lower level of innovation and the consequent depletion of the factors of production by altering its skill set to best maintain output, but by doing so it creates a negative feedback loop, starving innovation of necessary funding and thereby squeezing the economy still further.

The book *The Race Between Education and Technology* highlights that U.S. labour productivity per hour worked rose by 2.77% pa from 1947 to 1973 but then slowed to just 1.39% pa from 1973 to 1995. The US discarded 35% of potential output. Productivity growth is linked to educational attainment, which, as measured by the completed schooling levels of successive cohorts, was exceptionally rapid and continuous for three quarters of the 20th century. But educational advance then started to slow considerably for young adults beginning in the 1970's and for the overall labour force by the early 1980's. For those born from the 1870's to about 1950, every decade was accompanied by an increase of about 0.8 years of education. During that 80 year period the vast majority of parents had children whose educational attainment greatly exceeded theirs, but then from 1980 the educational change between the generations came to an abrupt stand still and a small reverse. The deterioration has been from those educated in the US rather than from an increase in the foreign born component of the workforce. An important part of the American dream that children will do better than their parents, has for the moment stalled.

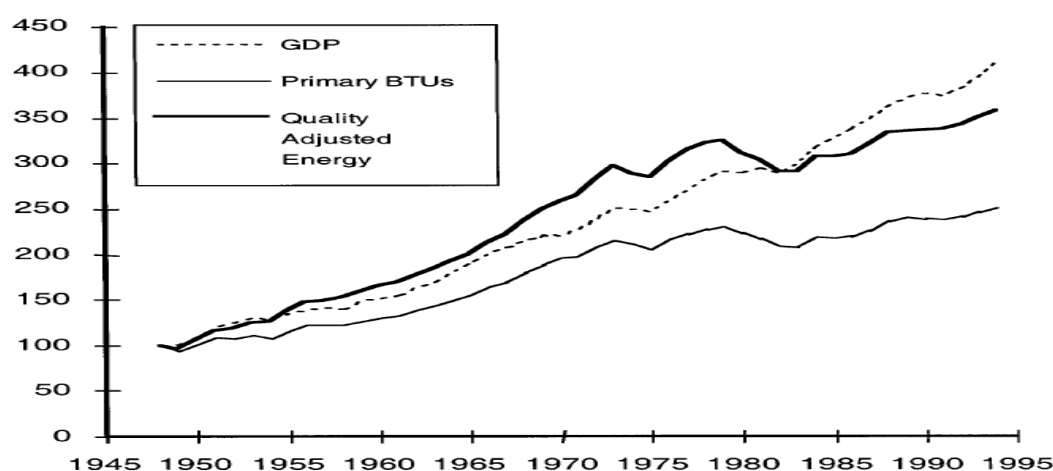
Western economic growth over the last 40 years has benefitted from demographic trends as dependency ratios have fallen. The so-called Baby Boomers that are passing through the labour market have boosted the ratio of workers to dependents, but that is starting to reverse as the population as a whole ages. The US Federal Reserve Bank of Boston has projected that the decline in the US workforce relative to the size of the population will mean that productivity has to rise by 40% by 2030 simply to maintain present living standards, and yet as we saw earlier the productivity is falling. The European Commission has projected that the potential growth rate in Europe will fall by 40% over the same period due to demographics. Either way that suggests that we need a compound 1.7% per annum increase in productivity simply to make up for this depletion of resources.

These figures will be dwarfed by similar problems in parts of Asia where the populations are still younger than in the West. The one child policy that China and others adopted initially resulted in the workforce expanding several times faster than the dependent population, but as more people now start to retire than there are new entrants into the workforce to replace, the dependency ratio will rise and the demographic dividend will start to reverse acting as a major headwind to productivity and

innovation. China's dependency ratio for example will rise by 227% over the next 30 years compared with the US ratio rising by just 75% according to UN data, whilst South Korea's workforce is set to collapse by 11.9% in the 2020's, a further 14.6% in the 2030's and an additional 12.3% in the 2040's leaving Standard & Poors to warn that without a fundamental reform of its pension system, the Korean government would sink to "speculative grade" by 2020. (Standard & Poors Global Greying Country Report: Korea. June 2006).

In terms of the productivity or efficiency of energy, there is a general view that there has been significant increases over time, and indeed in terms of GDP per BTU or per joule there is a significant efficiency gain, however adjusting for the density of energy, ie how it is delivered, paints a less impressive picture as per the chart below. More than 50% of the US energy efficiency gain since the 1970's is explained by using higher density energy. Unfortunately in recent years we have had to start using less dense sources of energy. By 2012/2013 coal is expected to replace oil as the world's main source of fossil fuel, and with very low-density alternative such as solar, bio-fuel and wind becoming a larger share of the mix, a lot of the recorded efficiency gains will start to reverse. This is already visible at a global level as China's low-density coal fuelled growth becomes an ever larger share of the global growth. Similarly with technological advancement lagging the geological decline, the productivity of drilling and mining is also set to deteriorate. Energy production is becoming increasingly resource intensive, consuming an ever greater share of the factors of production. Upstream and downstream capital and operating costs are soaring.

<http://www.energycrisis.com/cleveland/AggregationRoleOfEnergy.pdf>



There has been almost no gain in the efficiency of electric power generation & distribution, or of turning energy into mechanical work over the last 40 or 50 years, as we have approached the limits governed by the laws of thermodynamics. The only gains have come from medium and high temperature heat distribution, which has come from using high density energy such as that delivered by gas or electricity as oppose to the low density energy from coal. Without some new breakthrough in energy innovation, and with energy the primary factor input – (energy is the only factor input that cannot be substituted, and the calories burned or work done by fossil fuels is about 50 times as big as that done by human labour) - total factor productivity will gradually start to fall.

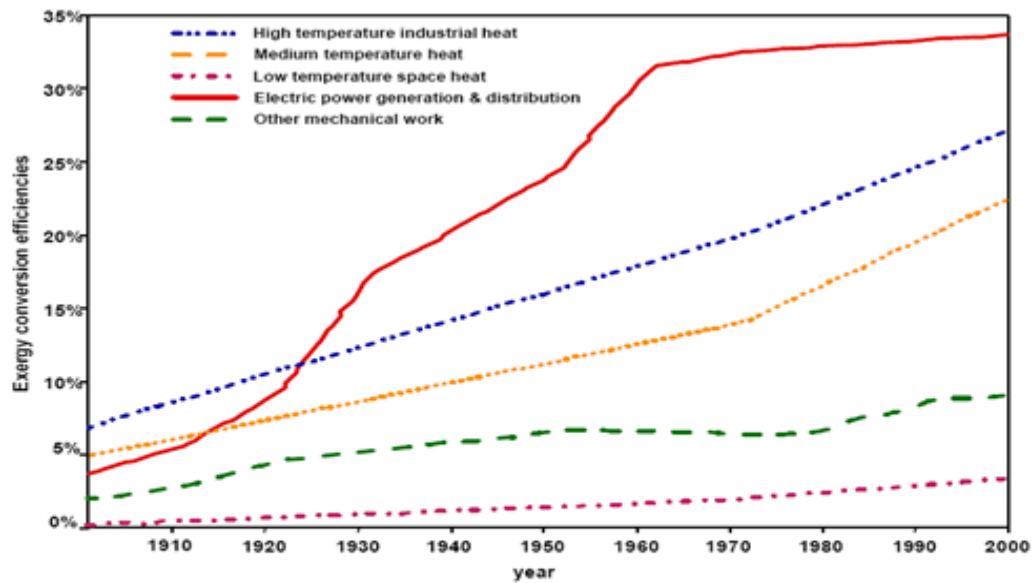


Figure 1: Energy (exergy) conversion efficiencies, USA 1900-1998

Accounting for Growth: The Role of Physical Work
<http://www.iea.org/work/2004/eeWP/Ayres-paper1.pdf>

Even if the laws of thermodynamics were not a barrier, the reality is that in order to become more energy efficient, you have to consume more energy. Total energy consumption rises but energy consumption per unit of output declines. The Institute for Integrated Economic Research (IIER) highlights that this causes a fundamental problem; that higher energy prices can never be compensated for with energy efficiency measures, only with lower consumption and lower real wages although frequently commentators confuse the two.

The facts are clear; total factor productivity growth has slumped due to a lack of innovation and without that advancement, resource constraint will act both as a direct and indirect headwind to the economy. The important question is why? Has society reached a genuine technology frontier or not. Accepting that would mean accepting a dire fate as we are consuming down the world's natural resources, and the carrying capacity of the Earth without fossil fuels or some sort of equivalent is only around 10% - 15% of the present levels, which is why people preaching peak demand of fossil fuels have quite frankly lost the plot. Has the level of difficulty and cost of achieving technological advancement become prohibitive and humanity reached its peak, or are there other more mundane reasons behind the slowdown that we can remedy?

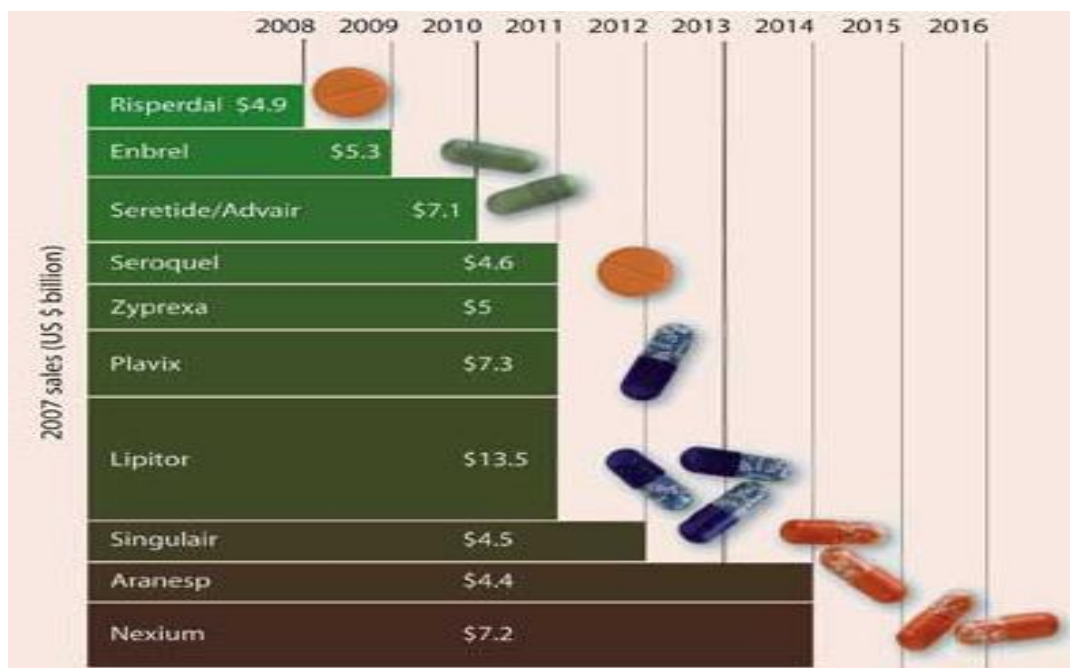
Chapter 3. The fate of humanity.

With the US Space Shuttle decommissioned, manned space flight is reliant on the 1960's Soyuz spacecraft and technologies that have not been updated for 20 years. "Sometime between 1995 and 2010, we needed to build something new, but we failed to do it" according to James Andrew Lewis, a senior fellow and director of the Technology and Public Policy Programme at the Centre for Strategic International Studies in Washington, adding that over the past decade the US has put USD120bn into NASA without the completion of any craft for manned missions. As evidenced by the number of recent failures Russia's manned space programme is also in a downward trajectory. Considering the astounding pace at which the US space program made developments during the 1950s and '60s for the Mercury, Gemini and Apollo projects, the developments made by the Space Shuttle program since its first flight in April of 1981 seem rather inadequate in comparison. Whatever happened to the Space Shuttle making access to space a routine and inexpensive activity? Why did the US ignore its space programme? Without the competition of an Arms Race and the military applications that space could offer, it would appear that there has been minimal progress in the delivery of space applications with US delivery costs of satellites also not coming down.

It is not just space however. "When tracked against the admittedly lofty hopes of the 1950's and 1960's, technological progress has fallen short in many domains" says Peter Thiel, the founding CEO of PayPal. "The centuries-long acceleration of travel reversed with the decommissioning of Concorde in 2003, to say nothing of the nightmarish delays caused by strikingly low-tech post 9-11 airport security systems". <http://www.nationalreview.com/articles/278758/end-future-peter-thiel>.

"The official explanation for the slowdown in travel centres on the high cost of fuel, which points to the much larger failure in energy innovation". What has happened to Nixon's 1974 call for full energy impendence by 1980 and why does Obama now think only 1/3rd oil independence by 2020 is achievable? Even if the most optimistic views of US oil production returning to its 1970's high prove correct, it will still leave it reliant on imports for about 50% of its oil needs. Why has nuclear fusion been 20 years away for the last 50 years and why are the main global fusion experimental reactors still those built in the 1970's? Why is our Uranium 235 expected to be exhausted within the next 15 to 20 years and yet the development of breeder technology, which could increase the efficiency of nuclear fission many fold, been starved of capital? Why is dirty, low density coal energy becoming the world's dominant fuel once again? Why are we replacing fossil fuels with inferior solar, wind and bio-fuels that became obsolete 200 years ago, and again in the 1980's? Why is a growing proportion of economic output being consumed by energy production leaving less for our own personal enjoyment?"

By the end of November 2011 Pfizer will have lost the USD10bn revenue stream from its blockbuster cholesterol drug Lipitor losing its basic product patent. Overall the industry has 10 major patents expiring affecting over USD63bn of revenue. 75% of all prescription drugs in the US are now generic. With less R&D success, pharmaceutical companies are having to slash staff numbers. "I don't think there's a company out there that doesn't realise they don't have enough products in the pipeline or the portfolio, don't have enough revenue to sustain their research and development" according to Drug Development at Tufts University in Massachusetts.



USD63bn of annual income to be lost from patent erosion by 2014.

RSC Advanced Chemical Sciences

Drug companies are pulling down the shutters on European research laboratories posing a serious challenge to the region's ambitions for creating new high tech jobs. "Across the drugs industry companies are consolidating their R&D activities as investors lose patience with the dismal returns made in recent years on new medicines". The cutbacks have been particularly severe in the UK which has historically punched above its weight in pharmaceutical research. Pfizer told the British parliament that the decision to pull out was simply a reflection on the poor returns on R&D; "The business model is just unsustainable" although it then promptly announced a share buy back.

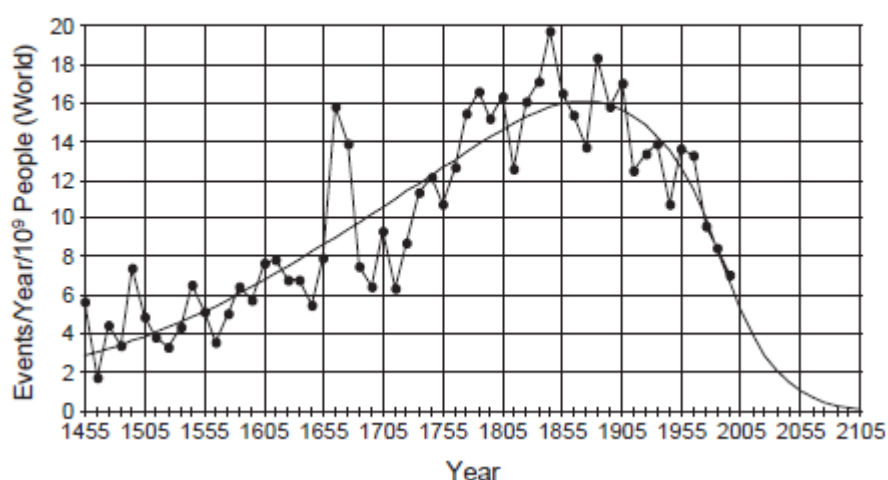
Cutting back R&D and focusing on generics may produce cost savings for the public in the short term but the longer term consequence is a deteriorating pipeline of new drugs. Whilst a lot of big diseases have already been attacked, it would be inaccurate to say that there aren't plenty more that desperately need a solution. There is also a huge amount that could be done with gene targeting, stem cells and regenerative treatments etc. With all these opportunities, why is the pace of progress slowing? Why is the business model unsustainable? The US government is sufficiently concerned that the National Institute of Health recently proposed a billion dollar drug development centre at the agency. "We seem to have a systemic problem here" adding that the government research efforts would feed the private sector rather than compete with it.

Scott Locklin's *The Myth of Technological Progress* says that the world of 50 years ago was pretty similar technologically to today. "In 1959 we had computers, international telephony, advanced

programming languages like Lisp, which remains the most advanced programming language, routine commercial jet flight, atomic power, internal combustion engines about the same as modern ones, supersonic fighter planes, television and the transistor”. He suggests the main technological advance in those 50 years was space flight and its spin-off technology, microelectronics. Most other advancements have simply been refinements and the distribution of the technology. The Internet for example is really just connecting the computer to the telegraph. Certainly more people are involved in “technological” jobs, and no one could argue that computers haven’t increased our ability to process information, but ultimately very little has changed. On the other hand if you look back from 1959 to 1909, or the 50 years prior to that the pace of innovation in different directions was far more dramatic. Cars are definitely safer than they were but there has been little efficiency gain over the period despite the headlines, except for the fact that we chose, are legislated or are priced into the more efficient car - <http://www.alternativeright.com/main/the-magazine/the-myth-of-technological-progress/>

The paper *A possible declining trend for worldwide innovation*, published in 2005 – (<http://accelerating.org/articles/InnovationHuebnerTFSC2005.pdf>) – suggests the rate of innovation as measured by the number of important technological developments per year divided by the world population peaked in the mid-19th century and has declined since. Whilst 1845 was the actual peak, it remained in the upward trend until 1915, and has suffered an accelerated decline from 1965 to 1995. When measured against the rise in educational spending, the decline would be even more severe. The paper suggests there are two different technological limits; one based on economics and the second based on the laws of physics. “Halfway to the technological limit, the rate of innovation reaches a maximum value that then starts to decline. As the technological limit is approached, the rate of innovation approaches zero, but it never reaches zero, so the rate of innovation follows a bell curve”. Whilst each additional technological improvement adds to the base from which other advances can happen, if the innovation of any individual technology follows this normal or Gaussian curve, then so too must the curve of innovation in total as determined by the Central Limit Theorem; not a promising sign. The paper suggests that we are approximately 85% to this limit and that the pace of technological development will diminish with each passing year.

J. Huebner / Technological Forecasting & Social Change 72 (2005) 980–986



We rightly distinguish between continuous and discontinuous innovation; revolution and evolution. It is well understood that basic science is ultimately the basis for industrial technology but as the benefits are often tangential and do not necessarily accrue to the inventor, this has to be done by the public sector. The fact that US Federal R&D spending has fallen from over 2% GDP in 1963 to less than 0.5% today is undoubtedly some of the reason for the slowdown, but based on this Central Limit Theorem, would it make any real difference?

What a dire prediction, and yet that seems to be the implicit message coming from people criticising the notion that innovation is slowing. The most frequent rejection is that science is continuing to push back the frontier, but with each success the difficulty of the task gets incrementally harder and harder. Precisely. I don't think anyone is trying to discredit the scientific community or diminish the gratitude we owe it, but even they seem to begrudgingly agree that the pace of advance is slowing. The second response is very understandable; what about Moore's Law to which I completely concur, but of course the fact that debt continues to soar relative to GDP suggests that these advances are not being exploited or channelled correctly into sustaining the economy, and therefore are perhaps developments that are not relevant for today's world. The final response is perhaps the most telling; that we have reached saturation and are happy with our lot.

The paper *Measuring Innovation in an Accelerating World*, written by John Smart of the Acceleration Studies Foundation, offers a detailed critique of the Huebner piece. There is some debate over some of the figures and the timing but its general rejection is based on the idea of declining marginal utility from each additional innovation, suggesting that like energy consumption people reach a point of saturation. "As technological progress increasingly satisfies current human needs, individuals become less concerned with technological development and turn more toward personal growth, unique experiences, and other activities which, while equally creative on an individual level, are less obvious examples of innovation in a technological sense". It suggests that humans have a finite set of physical needs such that "the kind of innovation that humans generate may also be changing, becoming increasingly higher order and abstract (eg more psychological, health, and stylistic innovation), and perhaps also harder to perceive. <http://www.accelerating.org/articles/huebnerinnovation.html>

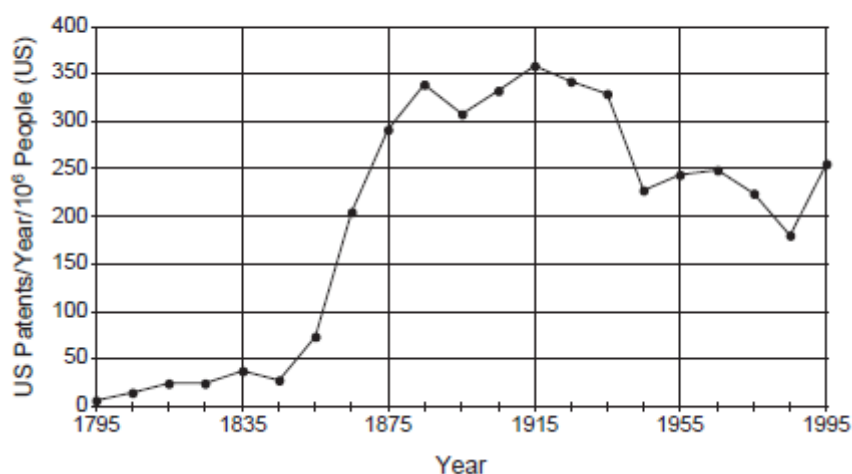
Unfortunately whilst I think John's argument on innovation saturation is perfectly valid and accurate, and it is backed by the growth of the service sector within the developed and developing economies and follows general economic views, unfortunately it is also flawed. Has the US really reached innovation saturation because it simply doesn't want any more physical goods, or has it reached it because it doesn't want any more of the same goods, ie simple diminishing marginal utility? Offer him a car that flies and hovers and I am sure he would love it if we had the energy to run it. The problem with John's argument that innovation is service based is that the service economy is ultimately reliant on innovation within the industrial economy to maintain available factors of production. Whilst it is absolutely correct that the economy is there to serve us, unfortunately it is a mutual relationship. We cannot keep taking without putting back; we are consuming down the balance sheet. Without fossil fuels or some sort of equivalent the carrying capacity of the Earth is just 10% - 15% of its present levels. Whether we like it or not, both ourselves and other factors of production are derivatives of fossil fuels. Unless that psychological, health, stylistic, and most importantly financial innovation, through improving our mental fitness and our allocation of capital actually supports this underlying dynamic, then what John describes as innovation is in fact a tax on the economy.

Another line of argument is that the huge value offered to us, seemingly free by the Internet is ignored in GDP calculations and therefore debt is over-estimated. Whilst no one can disagree that the Internet is extremely valuable - I have used it extensively in writing this report - the value is reflected in terms

of the beneficial impact it has on users' interaction with the rest of the economy. Like a lot of public goods, the value is simply recorded indirectly. The full value of the railways to Great Britain in the Industrial Revolution was never recognised in their profits or their market capitalisation; it could never be. If energy was priced at its full value it would be left underground because there would be no benefit in using it, but pricing it at a small premium over cost has afforded us all the benefits of the modern economy. The Internet's value is fully reflected in the size of the broader economy.

If research and development is subject to a diminishing marginal return, then it stands to reason that more resources are required to maintain the rate of scientific growth. The Industrial Revolution is often seen as a carbon or energy revolution. Not only did the energy from fossil fuels power a near eight-fold expansion in the world's population over the last 200 years from 900 million in 1800 to 7 billion today, but it also created the equivalent of about 350 billion energy slaves working for us 24 hours a day. Based purely on these simple figures the Industrial Revolution delivered a near four hundred-fold increase in the amount of "work done", which over the last 210 years would have equated to a 2.9% compound rate of growth. Given that fossil fuel production itself has followed a normal curve which is now peaking, its growth, necessary to compensate for the diminishing marginal return of research and development, would have peaked many years earlier. US energy production per unit of GDP for example peaked in around 1920, perhaps playing a part in the peaking of patents per capita at the same time. With growth in energy consumption increasingly centred on the emerging markets playing catch-up, it is very clear that resources are simply not being applied in the quantities required to push the scientific envelope. The marginal utility of innovation has seemingly been insufficient to justify the expense.

J. Huebner / Technological Forecasting & Social Change 72 (2005) 980–986



Rate of invention, with points the average over 10 years, the last being 1990- 1999

<http://accelerating.org/articles/InnovationHuebnerTFSC2005.pdf>

Whilst there are absolutely some exceptions, I think we can say with a large degree certainty from direct observation that innovation overall has slowed, and certainly within the non-service economy. We can also reinforce this implicitly from the slowdown in total factor productivity growth, the

flattening of the global economy, and the greater reliance on financial innovation to keep the whole illusion alive. Everything, including factor inputs themselves point in the same direction; innovation has definitely slowed.

Numerous explanations can be given. Governments invest where there has been success rather than where there might be success. The hierarchical structure of the global economy means that frequently any jobs created from successful government research programmes are not in the country of origin as it simply does not have the relevant concentration of expertise, infrastructure or systems to exploit and commercialise the invention, so why bother. From the private sector's perspective, funding is frequently not sufficient to take the idea to the next stage. Private equity used to be about start-ups but these days it is all about leveraged buyouts rather than innovation, whilst venture capitalists simply do not have either the size or duration of funding necessary for big new ideas. Similarly at the multinational level, with shareholder pressure for immediate performance it is far easier to support earnings through leverage and other financial innovation such as share buybacks rather than committing to long term programmes where there is no guaranteed success. The high turnover of leaders in both the public and private sector also detract from serious longer term programmes where the benefit of any spending is likely to be on someone else's watch and unlikely to be attributed to them, whereas the burden of the costs will be.

Whilst all of this makes perfect sense, where I would disagree is the view that it needs to be this way, that it's inevitable, that collapse is on its way and that the world is reaching the limits of exponential growth. If we imagine that Gaussian curve argument and the Central Limit Theorem are correct, that innovation peaked 150 years ago and that we are suffering the long tail of decline, then surely all we are saying is that the sum of all the individual lines of innovation that make up the Industrial Revolution is reaching its limit. It does not mean that a second revolution of even greater magnitude cannot happen. Looked at in a slightly different way, the Industrial Revolution was itself just a single Gaussian curve in the much bigger development of humanity, and given the size of the Universe and therefore the amount of resources potentially at our disposal you would have to be extremely pessimistic to think that the Industrial Revolution was just a single curve in isolation, rather than the start of a much bigger Gaussian curve.

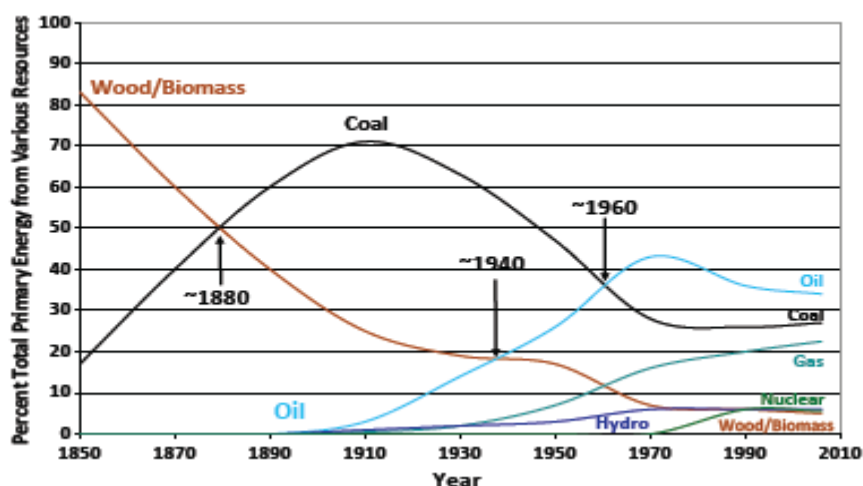
The book *The Singularity is Near* highlights that over the history of the Earth, innovation has been accelerating at an exponential pace. A billion years ago not much happened over the course of even 1 million years, but as life has progressed more and more has happened in each interval as atomic and then chemical processes turned into biological processes, DNA, natural selection, human intelligence and now the computational power of IT which is doubling every 2 years. Whilst the difficulty of the task may be increasing, the computational power to understand and solve the problems is also accelerating, and with that our knowledge is advancing. In just the same way that industrial equipment has allowed construction projects to be done in a mere fraction of the time it would have taken human labour alone, so IT power will allow new levels of scientific advancement to be made in years rather than millennia. When looked at in this context, it is very obvious that the decline in innovation we have been suffering from and the downward slope of the present Gaussian curve need be nothing more than a temporary phenomenon in a vastly bigger acceleration.

Ultimately the only real physical barrier we face today, with fossil fuel production approaching inevitable decline is finding the energy to fuel the innovation, but that in itself is simply a case of recognising the problem and directing the factors of production accordingly. As I will explain shortly, the difficulty of the task is in no way beyond our present capabilities, which means the barriers to innovation appear to be nothing more than social in terms of choice of how the increasingly limited

resources are deployed. At the moment society collectively chooses to consume and not to progress. Clearly this lack of drive is counter to everything that has got us here, and everything that is needed to find the resources to keep us alive. Something has gone drastically wrong in our reward structure such that we no longer allocate capital correctly.

The real underlying problem has been that the growth of fossil fuel production has been insufficient for many years now to both sustain present levels of economic output and at the same stage to afford the scale of investment necessary for science to overcome the increasing difficulty of the task. The energy production has also been increasingly diversified around the world, with the consequence that there are far more demands on the limited output, a trend that is likely to increase still further. The source of fuel has also become increasingly diversified requiring additional capital and infrastructure to compensate. Over the last 30 or 40 years this showed up as the slowdown in total factor productivity growth, the accumulation of debt and higher taxes, and the growth in both the financial sector and government, necessary to keep the illusion of growth alive and maintain social cohesion. When the supply of dense energy is accelerating and our standard of living improving in leaps and bounds, we can allocate capital correctly, however when the supply of energy is slowing we choose to sacrifice innovation in favour of present consumption; our time preference rises. Why is the supply of quality energy slowing? Surely this is not the end. Why are we not investing in the next generation energy supply to allow exponential growth to continue?

(http://www.oup.com/us/companion.websites/9780195325546/pdf/CMO_color_flyer.pdf)



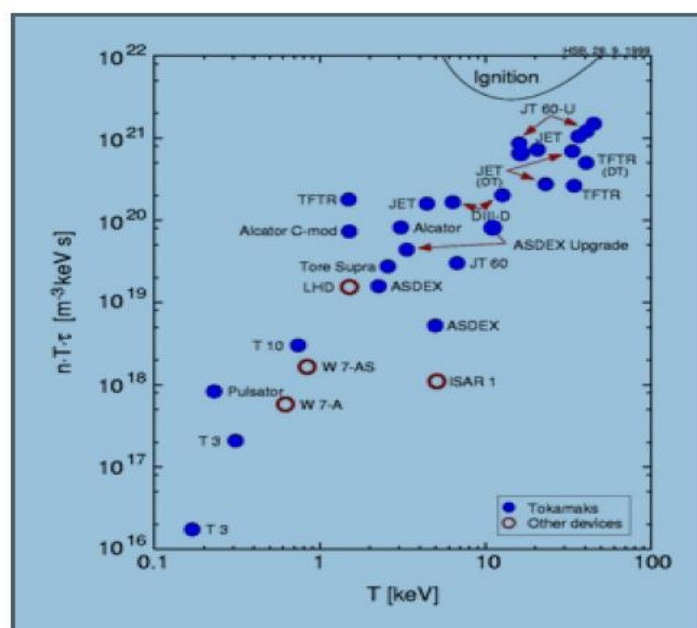
Global primary energy composition.

Nuclear fusion will replace fossil fuels assuming we decide to make the necessary investment. Whilst fossil fuels have served us extremely well, the growth in their production is nearing an end and we need technology to come up with some sort of new energy source if humanity is to move forward. Nuclear fusion will fulfil that role. It is not just about finding a replacement to fossil fuels, but it is finding some kind of energy source that can fuel the exponential demand growth that will be necessary for cutting edge innovation. The energy released from fusion of hydrogen atoms is about 10 million times bigger than from chemical reactions such as burning it or using it in fuel cells, and with sufficient reserves of hydrogen in the oceans to outlast the Sun at present rate of fuel consumption, fusion power should be able to fuel the advance of science to levels not yet even dreamed of.

Fusion releases energy by fusing the nuclei of atoms whose combined mass is slightly smaller than the sum of their individual masses, with the difference released as energy. Lawson's number, the product of the plasma density, confinement time and temperature, defines the conditions needed for a fusion reactor to reach ignition whereby the energy output is sufficient to balance all the losses and maintain plasma without any external power input. The Lawson's number – (please see my report Global Exhaustion for the full story) – has roughly doubled every 2 years for the last 50 years despite shoestring budgets, to levels where fusion is now within our grasp. The pace of technological progress has been faster than Moore's Law, however until energy breakeven is achieved, that improvement has little value. The interesting aspect is that there have been two parallel approaches; one concentrating on increased containment time – (magnetic confinement) - and the second on increased pressure – (inertial confinement). Both these routes have taken technologies to extremes. Private capital is now taking a middle ground; confining the plasma for a relatively short time and then applying pressure and thereby lowering by orders of magnitude the cutting edge science that is needed, and reducing the price immeasurably.

The principal reason why fusion energy is said to have been “twenty years away for the last fifty years” is that the investment programme required to deliver fusion could not be justified by political system that works on a 4 year election cycle. The required spending has simply not happened. The Manhattan Project, cost the US about 1.25% GDP spread over a 5 year time period and the Apollo Space Programme cost about 2.5% GDP spread over 14 years. Both these programmes pushed the boundary, developing not just the central core technology but all the vast systems that went into that technology. Money was thrown at the projects, explaining why the costs were so high, and why there were so many technological and engineering spin-offs. With no such urgency for fusion it has almost been a case of waiting for the technology to catch up with the idea; waiting for the computer & servo power and materials technology and modelling to advance sufficiently in other fields to make fusion now possible which is why some of the best opportunities now appear to be within the private sector.

http://fire.pppl.gov/energy_eu_wec01.pdf



**Nuclear Fusion's triple product has increased by 5 orders of magnitude over the last 3 decades.
Only a factor of 5 – 6 remains to be overcome before ignition is achieved.**

Both the Manhattan project and the Apollo programme had a singular and specific goal. For the Manhattan project, the goal was to create a nuclear bomb before Germany did, whilst the Apollo programme was designed to head off Soviet dominance of space. Both were technologies primarily for government use with little concern for the wider commercial viability according to the Congressional Research Service. Nuclear fusion's main goal would be to provide cheap energy, resulting in millions of job losses in the fossil fuel and related industries, which would clearly not be a vote winner. The cost of the Manhattan Project was 1.25% GDP, the cost of the Apollo Programme was 2.5% GDP, whilst the cost of not pushing the envelope and achieving nuclear fusion was the collapse in total factor productivity growth and the consequent surge in debt relative to GDP. Let's make no bones about it; we are in this mess, not because of a scientific shortfall, but because we have severely misallocated capital; the economics profession has fallen severely short. It seems that unless we have our backs to the wall, social democracy will always act to tax productivity and try to keep the status quo.

The idea that the pace of innovation has peaked never to be seen again is nonsense. Cheap nuclear fusion would give us the energy to re-ignite the innovation cycle on a scale never seen before. When you consider how new sciences such as nano technologies, gene technology, 3-dimensional molecular computing and artificial intelligence could all come together to drive society forward, you have to conclude that the Industrial Revolution was itself just the very beginning of a substantially bigger Gaussian curve. If this is the case, that it is not technological barriers per se that are holding us back, but rather the misallocation of capital, then given just what is at stake, you have to say that the economics profession has an awful lot of explaining to do.

Rolling out fusion should be relatively quick. General Fusion's technology for example could be used to retrofit old coal or gas power stations. With the infrastructure already in place, it would be like the diesel locomotives replacing the old fashioned steam engines, and with the time to reach innovation saturation falling over recent decades, this could perhaps be done in a decade or so. Exploiting the benefit of this in terms of the next revolution is likely to take some while longer as the whole education and mind-set will have to change from the stagnating position we have seen over the last 40 years back to something with some energy, vigour and vision in. With such light at the end of the tunnel however, and with increased supply of energy per capita theoretically reversing the fall in innovation per capita, this should come relatively quickly making for extremely exciting times.

Chapter 4. Getting what you pay for.

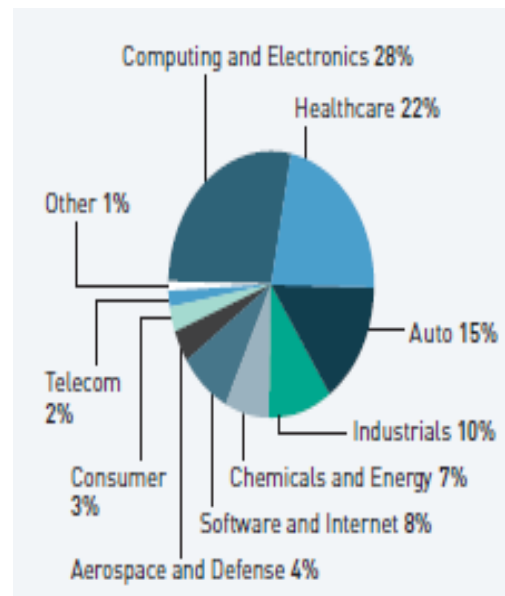
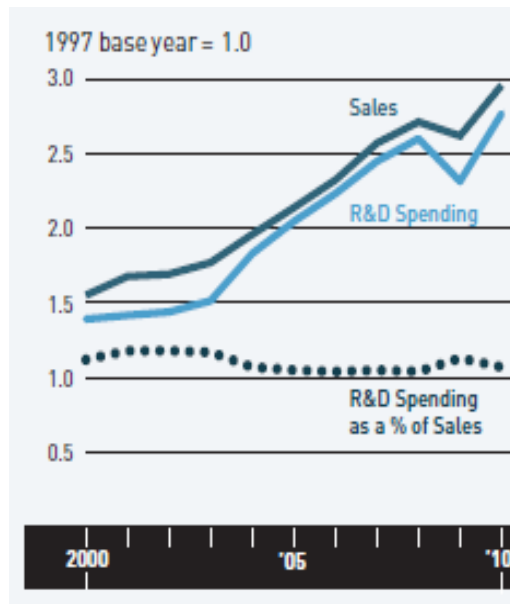
It is well understood that pure science is ultimately the basis for industrial technology, and that because the benefits do not necessarily accrue to the inventor or even in the sector envisaged, it needs to be carried out by the public sector. In the June 1945 report, *Science the Endless Frontier* – (<http://www.nsf.gov/about/history/vbush1945.htm>) - the engineer and science administrator Vannevar Bush argued that basic research was “the pacemaker of technological progress” and that new products and processes are “founded on new principles and new conceptions, which are in turn painstakingly developed by research in the purest realms of science”. It was widely recognised the importance of the Office of Scientific Research and Development (OSRD), set up in 1941, to the winning of the war, and to many other advances in physical sciences and medicine such as the mass production of penicillin and other drugs. Bush argued that with the war ending, this should be continued to the benefit of the economy and maintaining the US technological lead. Roosevelt recognised this saying “New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life”.

The OSRD became the National Scientific Foundation (NSF) with the view of supporting fundamental research and education in all non-medical fields of science and engineering. In fiscal year 2010 its annual budget was USD6.87bn, the equivalent of just 4.5bpts of GDP, compared with its healthcare counterpart’s budget of USD31.2bn and NASA’s USD18.7bn. Despite recognition that this is the only way to create more jobs and better lives for us all, the overall US Federal research and development budget has fallen from a peak of about 2% GDP in 1963 to around 0.5% GDP in 2005. Nanotechnology represents less than 1% of the federal research and development budget.

The private sector has been no better. At its peak, Bell Labs was the premier facility of its type, developing a wide range of revolutionary technologies, including radio astronomy, the transistor, the laser, information theory, the UNIX operating system, the C programming language and the C++ programming language, but in 2008, its parent Alcatel-Lucent announced its departure from basic science, material physics and semiconductor research, shifting its focus to more immediately marketable areas, adding to the huge cutbacks in pure research companies like IBM, GE, AT&T, Verizon and others. The *Global Innovation 1000* study shows that even at the top 1000 research and development spenders globally, budgets account for just 1% of sales. Survivorship bias would suggest that this is an overestimation, and given that we have already highlighted that over the last 30 or 40 years corporates have had to turn to cost cutting to offset weak revenue growth, this seemingly static 1% R&D expenditure as a percentage of sales will in fact be a declining line relative to earnings. 36% of the companies said that their innovation strategies are not well aligned to their overall strategy, and 47% said their culture does not support the innovation, suggesting they are not getting a great deal out of the research. (<http://www.booz.com/media/uploads/BoozCo-Global-Innovation-1000-2011-Culture-Key.pdf>)

The report characterises a company’s R&D expenditure into 3 categories; 1. Need Seekers where they are guided by customer requests, 2. Market Readers where they focus largely on incremental innovations to their products, and being “fast followers” in the marketplace, and 3. Technology Drivers, leveraging sustained investment in R&D to drive both breakthrough innovation and incremental change, although even here “tech drivers must strike the proper balance between the pure

R&D efforts that in the past led to high-tech breakthrough innovations, and the more market orientated activities of their less tech-centred brethren”. Whilst Hewlett Packard says that 1/3rd of their R&D budget involves assisting with current problems and 2/3rds is to create disruptive technologies, it seems that for most companies it is the other way around with for example 60% of the top 10 innovative companies all following the Need Seeker strategy. India and China’s 38.5% R&D growth,



albeit from a low base, is almost certain to follow the Need Seeker and Market Reader approach as it aims to develop low cost alternatives for the domestic market. Ernst & Young highlight that about 11% of North American companies spend more than a quarter of their research and development budgets in emerging markets, a figure which is expected to more than double over the next 5 years, but is this innovation or is it development of specific products to better meet local tastes?

The companies surveyed also attribute a very low tolerance for failure in the innovation process, which by definition means little in the way of breakthrough technology. According to the Dover Corporation; “Poor innovation performance is usually not caused by a lack of ideas or lack of aspirations. What some companies lack is the structure needed to effectively dedicate resources to innovation. It’s the lack of will to develop a strategy that can balance today’s needs versus tomorrow’s”. From my own experience, both in financial innovation and my involvement with corporates, very few people are willing to put their name on the line to an idea until someone else has developed and proved it, which means the vast majority of ideas simply do not get funding.

The top 100 Canadian – (<http://www.researchinfosource.com/media/2011Top100ListArticle.pdf>) - R&D spenders reduced their research and development budgets by 9.4% year over year in fiscal 2010 despite a 4.7% increase in combined revenues. It was the 5th consecutive year of decline and the 7th decline over the last 10 years. With revenues rising in all but two of those years, research intensity has fallen steadily. Reduced government incentives and the migration of manufacturing activity to the Far East both help explain the decline, as does the changing nature of corporate R&D itself. Historically most research was performed by in-house corporate research labs, whereas today they have largely disappeared being offloaded to suppliers.

As Barry Lynn's book *End of the Line* explains, as companies increasingly disaggregate their structure, outsourcing production and even assembly, they off-load much of the responsibility for research and development on to their suppliers. With highly specialised individual foundries supplying product to numerous end brands, the diversity of product and of the research and development falls, slowing the introduction of new technologies and reducing the amount of revolutionary as oppose to evolutionary development. A similar decline has happened from companies taking the Market Readers approach to an extreme, replacing R&D with M&A. Cisco was known as the "Borg" in the 1990's for innovating through acquisition. It would simply use its cheque book to buy companies and technologies that customers had identified as important. This was a path already trodden by Jack Welch, whose intolerance for failure resulted in GE dismantling its research programmes and acquiring growth through acquisition. As this requires someone else, presumably with a lot smaller balance sheet and cash flow to fund and market the development to the point where it is viable, fewer ideas make it from inception to fruition.

With little R&D spending from either government or corporations and with just a fraction of what is spent going on genuine innovation, the ball seems to fall on the venture capitalists (VC's). Mike Brown, the co-founder and chairman of Chrysalix, a venture capital firm investing in technologies that will drive the new energy economy, says that whilst people expect human ingenuity to always find a way, years of underfunding means the economy is now reliant on "miracles" or breakthrough inventions to survive. With resource constraint reducing government and household discretionary surpluses and raising the time preference of money, less funding is available to investigate the ideas and technology that may be able to fix the structures behind the debt problem. The big listed cash rich companies are not prepared to take early stage risks and encourage breakthrough technology, preferring instead to "farm" opportunities once they have been de-risked, whilst the venture capitalists do not have access to sufficiently large pools of equity to take and nurture this kind of experimental science. The typical VC fund has a 10 year lifetime from inception until liquidation, which means an average period of 7 to 8 years from start to finish of an investment, hardly enough for a company to develop and commercialise its breakthrough to the point of generating the revenues and profits necessary for the VC to make an exit, let alone a profitable exit. Mike concludes by saying that until the political will changes, technological changes will remain "incremental" at best with breakthrough ideas getting little or no funding. "What has worked up to now probably can't work much longer" without the already buckling economy crashing down. By the end of this decade there will be enormous demand for those breakthroughs; we will be praying for miracles.

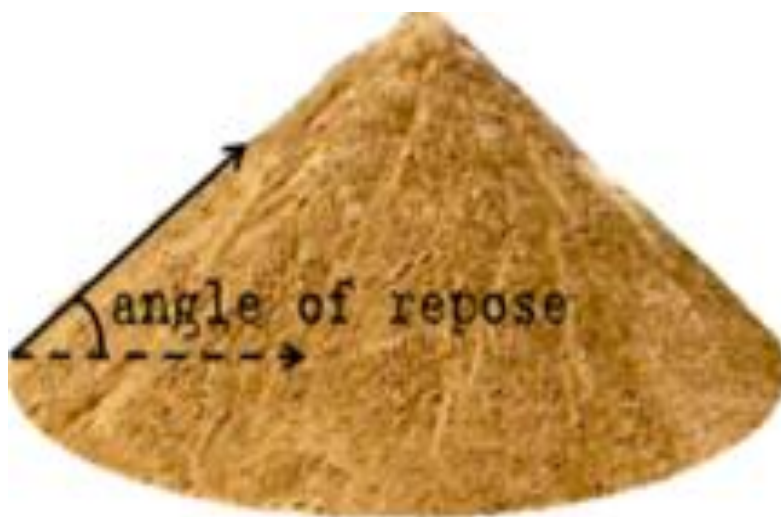
Whilst President Obama has observed that "maintaining our leadership in research and technology is crucial to America's success", and that, "In America, innovation doesn't just change our lives. It is how we make our living", he is clearly not willing to make the sacrifices in other parts of the economy to pay for it, as spending in real terms continues to fall. Certain projects are being given greater priority but in a zero sum, or should I say slightly shrinking sum game in terms of overall real budget. Unfortunately whilst Obama seems to at least talk the talk, the Republicans have argued that the US needs to cut almost all of its science R&D programmes in a bid to reduce the federal deficit. Of course if Federal R&D spending is falling, this will have a knock-on impact on corporate spending. The basic groundwork science is not being done, and without this the education and infrastructure on which the public sector can build has been gradually eroded away in a negative feedback loop. It is no-wonder that the United States has fallen behind 7 other countries – Israel, Sweden, Finland, Japan, South Korea, Switzerland and Iceland - in terms of research and development spending as a percentage of GDP, none of which other than Israel I would associate with groundbreaking ideas.

The paper *Can U.S. Reverse the Decline in R&D Spending: Global Competitiveness at Risk*, warns that the US faces an R&D crisis. It forgets however that with the US at the top of the economic pyramid, if the US is not pushing the boundaries, then none of us are. This is a crisis on global portions with major economic and social ramifications. The solutions - (it proposes increased Fed R&D spending on targeted projects, tax credits of at least 25% on R&D expenditure, coordinated industry & university projects, and venture capital funding of game-changing technologies) – mean changing the allocation of resources. Rather than reducing R&D to maintain social spending programmes, those social programmes have to be sacrificed in favour of innovation. This is a sea-change in social, political and economic thinking that has to happen.

Leverage and financial engineering, and the underwriting of money supply by the central banks have made returns far more certain from “playing with money” rather than investing in real ideas and innovation.

Chapter 5. Playing in the Sand.

The *critical angle of repose* of a granular material such as sand is the steepest angle it can be piled before it falls over. In mechanics it refers to the maximum angle at which an object can rest on an inclined plane without sliding down. It is related to the density, surface area and shapes of the particles, and the coefficient of friction of the material. Similar logic must apply to the economy and the amount of debt or misallocated capital that it can support. Debt neither rising nor falling relative to GDP must be the optimum angle, but with the headwinds from resource constraint and demographics meaning that GDP itself will shrink, the angle of repose will require absolute debt to fall simply to remain static relative to GDP. If debt is not reduced in-line with GDP, then productivity will be sub-optimal.



Based on our present level of scientific understanding, there are a limited number of resources available to the economy, and thereby a limited potential output. Scientific advancement is essential to the economy's survival. It is necessary just to stand still, offsetting resource depletion. Sub-optimal use of the factors of production, reflected financially as debt rising relative to GDP, will deplete resources rapidly resulting in economic stagnation and eventual contraction. The real cost of capital will rise, taxing innovation and thereby limiting economic potential. Any use of capital or resources that results in debt rising relative to GDP removes those factors of production from alternative uses and thereby raises the cost of capital for other projects. Inefficiency crowds out efficiency.

Economic output is ultimately governed by the level of technology and the factors of production it makes available. Equally the level of technology is limited by the size of the economy and the factors of production that are able to be directed at innovation. Without innovation the factors of production will naturally decline, be consumed, or eventually deteriorate. For anyone with a basic understanding of science, they will realise that the economy is ultimately governed therefore by the second law of thermodynamics, and that without innovation the economy would tend to disorder and a simpler state

over time. Work must be done to offset the decay, but in a closed system an element of that work must be innovation.

Without innovation, output can only be maintained at the expense of depleting the factors of production, and increasing the interdependence within the network, i.e. debt rising relative to GDP and increased systemic risk. The level of safety within the system is drastically reduced opening the economy to possible catastrophic collapses. Imagine building a sand pile by gradually adding grains of sand, but as you add sand, you colour red all the areas of the pile that achieve this critical angle, thereby directing your efforts to other areas. Eventually the tendrils of red start to interconnect and you have an avalanche on your hands; a cascade collapse. The breadth of the crash depends on the degree of linkage and the degree to which each part of the network is loaded. "If we keep adding load without adding capacity we overload the entire network and thus make an all-encompassing avalanche inevitable". Various financial instruments and quite frankly various jobs and professions were created to share this risk, but capacity was not added to deal with the possibility of default. Whilst banks failed to back-up debt with liquidity, this was simply the financial representation of the real economy failing to add new capacity through innovation. Economists, central bankers and politicians setting policy around an output gap that does not exist, are taxing productivity and thereby adding load to the network, making an all-encompassing avalanche increasingly likely. (<http://anz.theoil Drum.com/node/3377>).

If we cannot allocate capital productively, we must endeavour to allocate it as optimally as possible, taking account of such things as the need for on-going maintenance to keep those factors of production, including the unemployed workforce, in useable order. Nevertheless whilst there has to be some flexibility in the short term, the continued misallocation of capital would result in a feedback loop. Lower productivity would reduce the available factors of production thereby adding still further to the misallocation of capital. The collapse of the Roman Empire, the subsequent period of intellectual darkness, the reduced population and de-urbanisation known as the Dark Ages, were the inevitable consequences of continued misallocation of capital. The economy had to shrink to a lower order of complexity to realign productively with the resources of the day. Creative destruction is fundamental to an economy's survival, and fighting it with social transfers is a war that cannot be won.

Without innovation, economic potential is limited by the different factors of production available at the time, and without complete substitutability the useful capacity of each factor of production is limited relative to another. Energy is the only factor of production that cannot be substituted. At any given level of technology therefore, there must be an optimum level of population with the rest simply dependent on the productive part of the economy. From an economic or productivity perspective, dividing the output over a larger number of people simply does not equate. It is a tax on the economy and therefore on innovation itself.

Unfortunately not all savings are equal. Whilst economists tell us that for every current account deficit, there is a surplus which nets off, in reality they don't. It is not the savings or debt that is relevant, but rather the different factors of production they control, and what those factors of production can do. The situation today of China running a large savings surplus against the American deficit has resulted in an excess of low level workers in the United States. The US consumption deficit, or in this case labour surplus, is accordingly in low level workers rather than those likely to generate breakthrough technology. Had the United States output been sufficient to keep its population content, and therefore generate a positive savings ratio, that excess could have been invested in research and development which may produce a positive return. As it is, any surplus from the

productive economy has to be directed at supporting the unemployed, whilst China's savings are directed at narrowing the gap with the West rather than innovation. The so-called US savings deficit is in reality a blue-collar labour surplus which is supported by taxing the productive economy. China's savings on the other hand represent a deficit of domestic white collar workers or innovative investment. The direction of the savings from developing economies to the developed is the wrong way around; it is capital consumptive rather than productive, and therefore ultimately unsustainable. The dollar standard or similar debtor system that requires the US to run a current account deficit – (the so-called Triffin Dilemma) - carries its own seed of destruction. A creditor system such as the Gold Standard by comparison is capital and productivity accretive.

Trying to optimally align an economic system that needs capital to be allocated productively with a social system that needs capital to be allocated according to other drivers is always going to be sub-optimal. For countries such as China or India therefore, accounting for 37% of the world's population but only 8.8% of the world's land mass (9.4% if you strip out Russia), this task is near impossible. This is nothing to do with ideology; it is a simple numbers game. The only way they can see their GDP per capita equate with the West would be if technology improved to such an extent that the whole population could be deployed productively. Without that innovation, there will be insufficient factors of production available to support the social needs, and the economy will fall into a technology to social deficit. As it is the cost of Chinese growth over the last 20 years has been a rapid depletion of domestic factors of production, making it both unsustainable and, over time, almost certain to reverse and implode. Vast ghost cities, near record housing stock relative to GDP and high speed railways that are not required, are consuming down, rather than adding to the potential pool of resources.

International assets acquired whilst running current account surpluses, and necessary to the on-going domestic economic output, will eventually have to be sold as the technology deficit relative to the social demands erodes competitiveness, forcing asset sales. The location and ownership of assets will change as this technology to social balance changes. European banks are already suffering from this with stories of them as likely forced sellers of USD1trn of Chinese assets in 2012. China's large FX reserves accrued whilst the population was paid a minimal wage and whilst the country was self-sufficient in food and energy, are likely to be reversed now that wages are rising rapidly relative to productivity and the country is in increasingly severe resource deficit.

On the ideological front, socialist systems will always fail over the longer term as their very philosophy - social ownership of the means of production and cooperative management of the economy - is in contrast to the reward structure necessary for innovation. With the priority simply for "fairer" distribution of existing goods rather than competition and a return for hard work, the balance sheet of factors of production are consumed down rather than continually added to via innovation. This is exactly where we are today. Anyone describing the modern economy as a capitalist system needs to find a dictionary. Rather than being in alignment, today's social system is simply raiding the economy for everything it can get. The globalisation of the economy and the growth in global imbalances that we have seen in recent decades reflects this; vertical innovation has been replaced with horizontal taxation. Scientific and technological expansion of the balance sheet has made way for global factor mobilisation with all its consequent feedback loops of increased consumption, higher non-productive dependency ratios and most importantly reduced productivity.

Perhaps some of the emerging Asian economies that have done so well in recent years will continue to perform, but if that is the case their growth will have to be at the expense of developed world consumption. In reality however it is hard to imagine the developing economies actually being the

winners as their relative productivity remains very low and consequently their factors of production are being exhausted that much more quickly. This will rapidly reverse the growth in technology and capital relative to social needs and expectations, shifting the economy rapidly to a *technology-to-social* deficit. With China consuming 7 times the energy per unit of GDP as Germany for example, once its energy imports exceed 14.2%, or 1/7th of its total, then it will no longer be able to subsidise its inefficiency with cheap domestic energy production. It will have to subsidise it with cheaper labour or other factors of production. China's growth has already been to a large extent factor driven, exhausting its supply of cheap labour, agricultural and water production, which now leaves the Western economies with high unemployment rates and surplus food production at a competitive advantage. With the US and Europe restructuring through both market and self-imposed austerity, it is unlikely to be long before either the Western economies, or the resource rich but technologically deficient emerging economies, start to price China out.

With an angle of repose determined by the correct allocation of capital and with limited factors of production based on today's technology, an individual economy has a limited capacity or maximum potential size. Economies with high unemployment, high old age dependency ratios and large unproductive social and economic systems will be much flatter pyramids, with deficits of technology and innovation to that necessary to sustain them. Combining economies through trade and capital flows should help optimise the factors of production either as individual economies or effectively as one large economy, however that also needs optimal allocation of capital. The huge growth in world FX reserves over the past 10 – 20 years, the consequence of capital controls, wage constraints and transfer payments, shows this is simply not happening. With trillions of dollars of capital now badly misallocated, the global economy is becoming flatter and the innovation deficit larger. With little financial or real slack in the system, the consequence of resource constraint has shifted from lifting prices and reducing savings and investment to now destroying demand. The factors of production are being exhausted and the economy is starting to erode.



The pyramids at Giza

(Vertical innovation has been replaced with horizontal taxation)



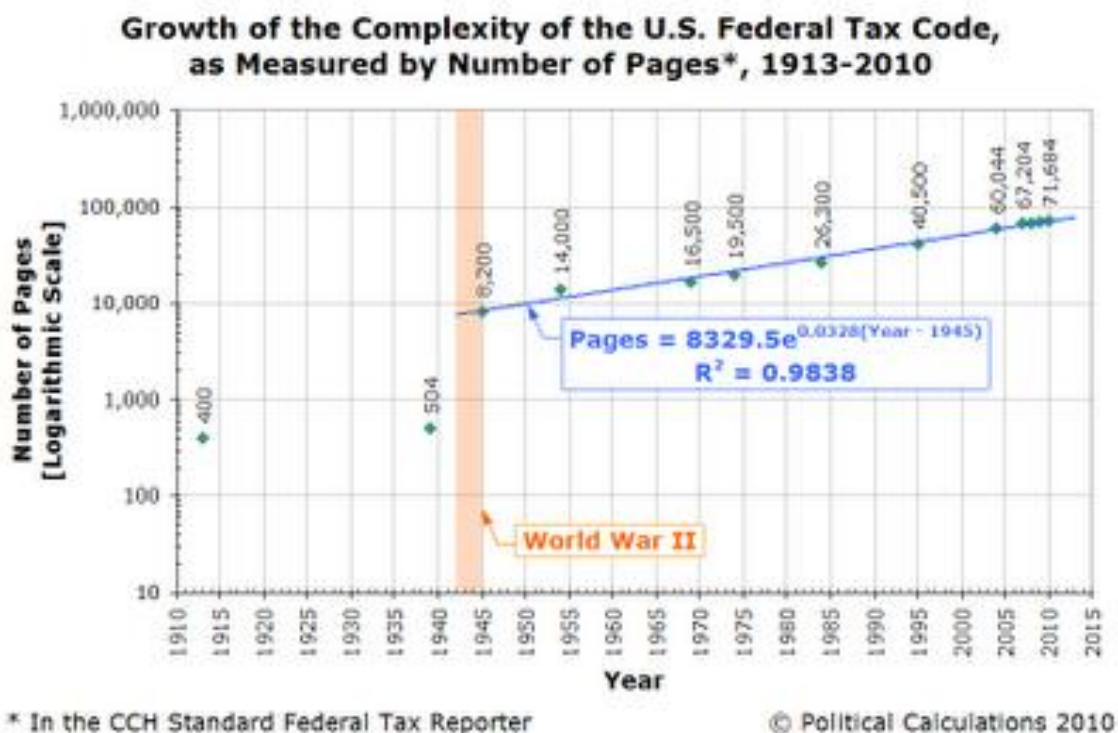
Misallocating capital will eventually result in the economy crumbling.

A frequent response to the speed of aircraft not improving over the last 30 or 40 years is that the ability for the average person to afford it has improved. This is absolutely correct, but whilst on the face of it this is positive, in reality it is part of the problem. The economic pyramid has become very flat with a broadening base taking capital away from the innovation that could expand the whole balance sheet of factors of production. Revenue per unit growth has shifted from an uptrend to a downtrend such that cost reduction becomes the primary earnings driver.

The collapse of the Soviet Union is a perfect example of an economy misallocating resources resulting in low productivity and ultimately the depletion of its factors of production. Life expectancy, food and oil production all completely collapsed. The pursuit of technology to win the Arms Race starved other industries of capital, leaving them with a ruined economy and outdated systems. Even the Faustian bargain to maintain oil production at all cost failed as it left industry antiquated and inefficient at turning energy into useful work. Soviet technology simply could not support the weight of its own misallocated capital. Today, with western technology able to create huge value out of the same Soviet oil, production is now at record highs, but within the broader economy corruption and the misallocation of capital remains rife. As the 2008 financial crisis showed us, without external trade of western technology for Russian resources, the Russian economy would collapse as it is not reinvesting its revenue in developing and modernising its own economy. It is depleting its factors of production at a faster and faster pace.

Whereas the economies of modern day Russia and places like India suffer from corruption resulting in sub-optimal use of capital, our Western systems of social democracy are almost designed to misallocate capital. Government can provide some public services well, but in reality most of what they do both through direct transfer of wealth, and perhaps even more importantly, indirect transfers and distortions through excessive regulations can be a clear drag on the economy. Whilst accountants are necessary to present data on a fair and consistent basis, the industry has undoubtedly grown with

the exponential growth in complexity of the tax code, which as the log chart below shows, has grown from 400 pages long in 1913 to 504 pages in 1939, before exploding after WWII at an exponential rate of 3.28% pa to reach 71,684 pages in 2010. An increased complexity in the legal system has increased the ratio of lawyers to jobs in general by over 100% between 1970 and 2000 – (<http://www.law.harvard.edu/programs/plp/pages/statistics.php>), whilst the advancement in life expectancy has come at the cost of a near doubling of the percentage of the workforce in healthcare between 1970 and 2000 to over 7%. Whilst these may be socially positive, they are all forms of tax on the economy.



Social democracy removes the incentives to work, replacing the family support structure, which encourages the whole family including the elderly to optimise their effort, with today's entitlement and transfer system that acts to discourage work. There is a major difference between working for yourself and your broader family where you can see the benefit of your efforts and can have some element of control over how the money is used, and a system of taxes and transfer payments where there is little accountability, particularly when the public sector and dependents make up such a large proportion of the voting public. As the book *Democracy, the God that Failed* says, the benefits of the centrally managed social systems fall short of their costs. Smaller economies such as Switzerland, which should naturally suffer from their size, can more than offset their disadvantage by avoiding the bureaucracy and inefficiency and high taxation that social democracy imposes, by simply being less regulated and having a smaller government.

Parkinson's Law says that "work expands as to fill the time available for its completion", and that "expenditure rises to meet incomes". Bureaucracies expand over time as officials make work for each other, with teams of hierarchical structures being formed. The Archdruid Report, *The Future Can't*

Pay its Bills says “The result, in most industrial societies, is an economy in which only a small fraction of the labour force actually has anything directly to do with the production of goods and services, while the rest are kept busy managing the sprawling social and economic machinery that has come into being to organise, finance, manage, staff, market, advertise, sell, analyse, tax, regulate, review, praise and denounce the production of goods and services. What seems to have been lost sight of, though, is that this immense superstructure all rests on the same foundation as any other economy, the use of energy to convert raw materials into goods and services”. More to the point, it depends on a certain level of surplus being directed into innovation to ensure a continuous renewal and preferably expansion of the factors of production. Without that, the economy will gradually collapse under its own weight, leaving this unproductive social superstructure of human resource managers, corporate image consultants, strategic marketing experts and disconnected management and the like with about as much chance of finding jobs in their fields as they would have had 200 years earlier in much less complex economies and societies. (<http://thearchdruidreport.blogspot.com/2011/12/future-cant-pay-its-bills.html>).

Whilst the angle of repose would appear to reflect the optimal allocation of capital with debt neither rising nor falling relative to GDP, it is a fluid situation. If GDP is rising aggressively, then debt should be allowed to rise equally as fast such that the full benefit of the innovation and greater pool of resources available is reinvested in the economy as a whole. Aggressively growing the stock of outstanding debt is perfectly in tune with a rapidly growing healthy economy, so long as the debt is not growing relative to GDP. Similarly if innovation is failing to offset the depletion of the factors of production, then debt has to shrink in-line with GDP. Excessive austerity would mean idling factors of production needlessly and would therefore be suboptimal, however knowing that innovation is the only way to increase the effective balance sheet, the use of resources must be skewed to that aim. Having an optimal allocation of the factors of production does not guarantee growth, but through competition and reward structures, it provides the best breeding ground for innovation and productivity.

The level of outstanding debt is less relevant than its rate of change relative to GDP, yet all the focus of research in recent years is how to lower the outstanding debt; either through default, inflation or a wealth tax. Even if the debt was wiped out in its entirety, so long as the factors of production behind that debt are still misallocated, and therefore unproductive, debt will continue to rise relative to GDP. All that has been achieved is a rebasing of the level from which debt is accumulating. The important aspect is to allocate capital sufficiently productively that debt stops rising relative to GDP. Unfortunately, with the available factors of production in decline due to resource constraint, outstanding debt will need to be paid down just for the ratio to remain unchanged. The adjustment has to cover not only the primary deficit, but also the coupon which in real terms is likely to be rising due to the slowdown or contraction, and disinflation, in the economy. The relevance of the stock of debt is the size of the interest hurdle that has to be overcome from reallocating capital, and the increased volatility it causes as it is a nominal payment in a real world. The important aspect is not the outstanding debt but rather maintaining the correct shape of the economy by optimal deployment of the factors of production.

As the economy gets out of shape and the factors of production decline, feedback loops rapidly intensify the problem. When considering the demographic bust we presently face for example, most concern is understandably directed at the relative shortfall of workers that the rising dependency ratio implies. The real concern should however be on the second derivative. How does the reduction in free capital affect R&D and subsequent innovation? This is a small figure squeezed between two large figures, and to most people having to make sacrifices and who don't understand it in the normal

course of events, it is probably less relevant than ever. Rather than a shortfall of workers, the real issue is the relative decline in the capital-to-labour ratio that squeezing spending would mean. If we are to get out of this mess the factors of production must be deployed productively. Maintaining the correct shape of the economy as determined by the angle of repose for the optimal allocation of capital is essential.

Economists' and politicians' need to create demand at all costs, is counterproductive. Demand must be limited by the "cash flow" of energy and the balance sheet of factors of production. Sustainable growth can only be driven by the supply side or innovation, creating new products and new markets. Fiscal stimulus should therefore be aimed at bold new sciences and technology aimed at balance sheet expansion. The greater multiplier from giving money to the poor is fools' economics. Yes they will spend a larger proportion of that benefit and so it does have a higher multiplier for a short period of time, but of course they will spend the money on basic goods rather than on cutting edge technologies; the Keynesian stimulus will speed up the consumption of resources adding to the misallocation of capital and flattening the economic pyramid still further. Rather the money has to be spent deploying the factors of production in pushing the technological and scientific boundaries. We have to realise the economy is a living system that needs feeding and nurturing rather than just as a source from which we can keep consuming capital without putting back. The social system has to reflect the reality of the economy; doing otherwise causes immense long term damage to our well-being.

Given that financial innovation, capital controls and other transfers are simply ways of adding to total factor mobilisation, there must ultimately be a limit to how flat the pyramid can get. This is not an exact science, and with the economy so large and complicated, and with delays or friction between investment in research and development and subsequent results and return on capital, it is difficult to know on a day to day basis whether capital is being allocated productively or not. Over time the growth of debt relative to GDP will define a clear signal, but even here we must be careful to aggregate trading blocs rather than just individual countries. Ultimately however economic output will be limited by the balance sheet of factors of production. The longer the misallocation of capital continues, the deeper the balance sheet drawdown and the less money available to support innovation, leaving our economy increasingly dependent on some sort of miracle or breakthrough technology just to survive.

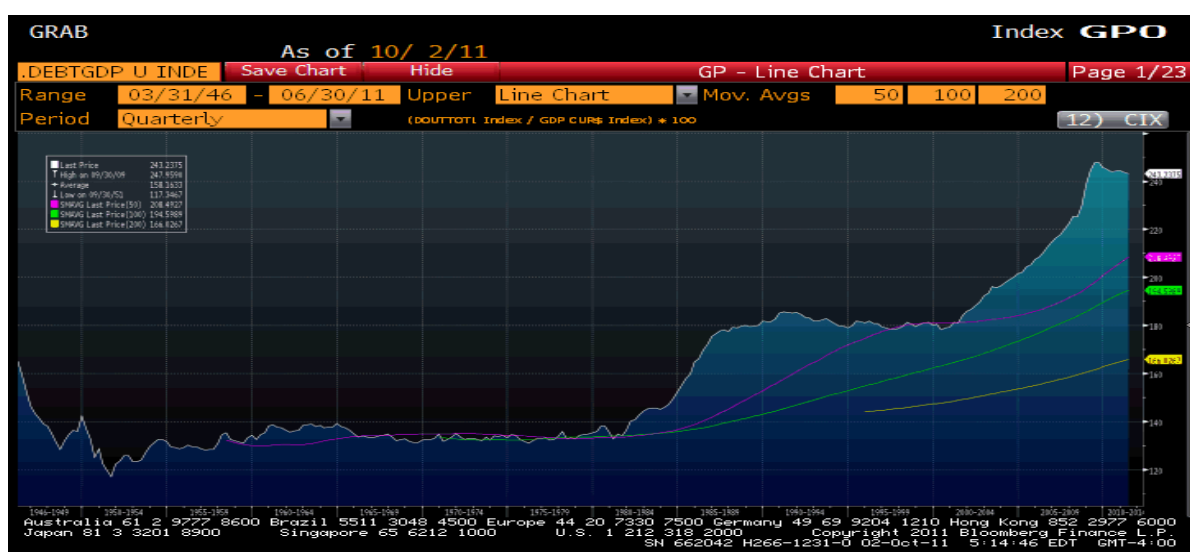
Chapter 6. The Lie.

In a closed system, there is no way to maintain output let alone grow the economy without innovation. The breakup of Bretton Woods in August 1971 and the adoption of a purely fiat international monetary system however, opened up more of the world's resources to Western technology. This was supplemented still further with the subsequent collapse of the Soviet Bloc and their adoption of the dollar standard. The opening up of the international markets gave us access to their resources enabling the party to go on longer, but this could only ever be a short term fix. It was never a genuine solution, and now, with those resources to a large extent exhausted, we face a severe slowdown.

After WWII, the ratio of US non-financial sector debt:GDP fell to a low of 117.3% in 1951. It then started to rise again, initially due to the Korean War and then Vietnam. During the late 1960's the US increasingly had to borrow internationally from its allies through the Gold Pool. Eight of the Federal Reserve banks and 7 European central banks agreed on 1st November 1961 to cooperate in maintaining the Bretton Woods System of fixed-rate convertible currencies and defending the gold price. Europe and Japan had entered into a transfer union to subsidise the US's excess spending. This was the price they had to pay for the security offered by the US, hence why the US current account deficit became associated with the cost of it being the global policeman.

Despite the wars, the build-up of debt was minimal, however once US domestic oil production had peaked in the late 1960's, the US no longer had the excess factors of production to maintain the pace of innovation without sacrificing its immediate standard of living and political goals, something it was not prepared to do. Instead the US increasingly had to borrow from abroad, selling down its assets and technology to maintain economic growth. It did what Britain had done 60 years earlier; it started to mortgage its future to maintain the illusion of growth. With the world shifting to the dollar standard the US could borrow from abroad in its own currency in just the same way that Britain had been able to borrow in sterling from its Empire and Commonwealth; an exorbitant privilege for the US and a tax on the rest of the world. Whereas trade under a creditor system such as the Gold Standard is based on competition and productivity, under the present debtor system the world's most advanced economy is able to simply print money and borrow from abroad, reducing its incentive to invest in cutting edge science and new technology.

US non-financial sector debt : GDP



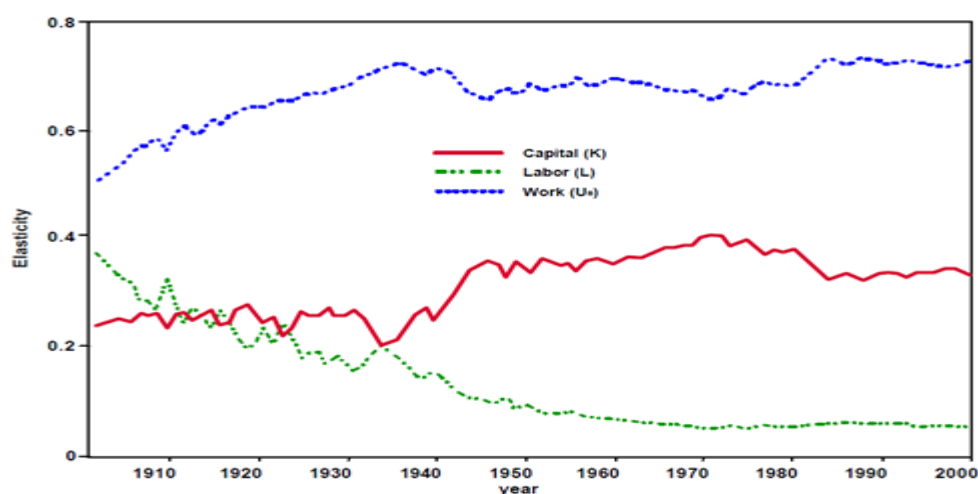
According to the Federal Reserve Bank of San Francisco's web site, US "Monetary policy has two basic goals: to promote "maximum" sustainable output and employment and to promote "stable" prices", goals that were prescribed in a 1977 amendment to the Federal Reserve Act. Since the Act, US debt has soared relative to GDP, clearly indicating that the factors of production have been misallocated and that consequently long term "sustainable" output has been sacrificed. This is reinforced by www.shadowstats.com's analysis which shows US unemployment significantly higher than stated when adjusted for long term discouraged workers that have been defined out of official figures over the last 20 years or so. It also reports substantially higher CPI when calculated using the methodologies in place in 1980. With the exception of the few years immediately following the change to the Federal Reserve Act, it is clear the Fed has not fulfilled its mandate, but with official figures distorting signals so heavily it is also understandable how it has been allowed to continue making policy mistakes, unchecked.

The overwhelming economic imperative of today is sufficient economic growth to support full employment. There is no consideration of whether that output is productive and makes a positive return on the factors of production or not. Digging holes in the ground to then fill them in again, or as in 2008 /2009 destroying old cars to build new ones, is seen as employment. The lack of backbone by governments to make necessary austerity cuts raises the cost of capital for everyone, taxing productivity and innovation to support unproductive zombie companies and public sector jobs; typical crowding out that weighs on the competitiveness of the economy overall. A Herald Tribune article on the 27th October 2011 argued the benefits to the economy for switching to wind and solar power were that it would create about twice as many jobs as would be the case with fossil fuels. Even if it was creating jobs in the US as oppose to job losses elsewhere, they are wasteful jobs; they are needless and therefore unproductive and they consume valuable resources. This is exactly what the growth of debt relative to GDP means. Economic and monetary policies, which are obviously sub-sets of political policy, have resulted in a continual misallocation of resources for the last 30 or 40 years.

The marginal productivity of labour (green line) has fallen fairly continually for the last 100 years. As you can see whilst labour used to be important, today it is quite frankly irrelevant in the scheme of things. Why? Clearly the scientist and entrepreneur can make major differences, but this is mainly from deploying the other factors of production in different ways. The majority of us can easily be replaced by capital (red line) and energy (blue line), but that should free us up for other more useful tasks. Clearly this has not been the case; we have not found new productive niches. Our education systems have not adjusted to this reality, leaving the majority of us with skills that cannot compete with today's technology, and therefore making us to all intents and purposes, economically obsolete. Whilst machinery can do a lot of repeatable tasks better than individuals, it cannot think; it cannot dream. It has no imagination. The financial and economic system we have today has rewarded capital's repeatability over the different interpretations and skills of individuals. There is not enough science, advancement, entrepreneurship, imagination or even ideas and individualism. High involuntary US unemployment is reflective of this misallocation of capital.

The fact that the marginal productivity of capital peaked in the early 1970's and has fallen ever since highlights how even our scientists are failing to deliver, and now with technology no longer keeping pace with the geological decline in energy and resource production, the marginal productivity of all 3 factors of production are in decline. Unless arrested by some sort of breakthrough technology or long term policy change that triggers a more productive allocation of capital, this decline will feed on

itself. Not only will the balance sheet of technically recoverable factors of production fall, but so too their productivity.



**Marginal Productivities (elasticity) of each factor of production,
USA 1900 – 1998**

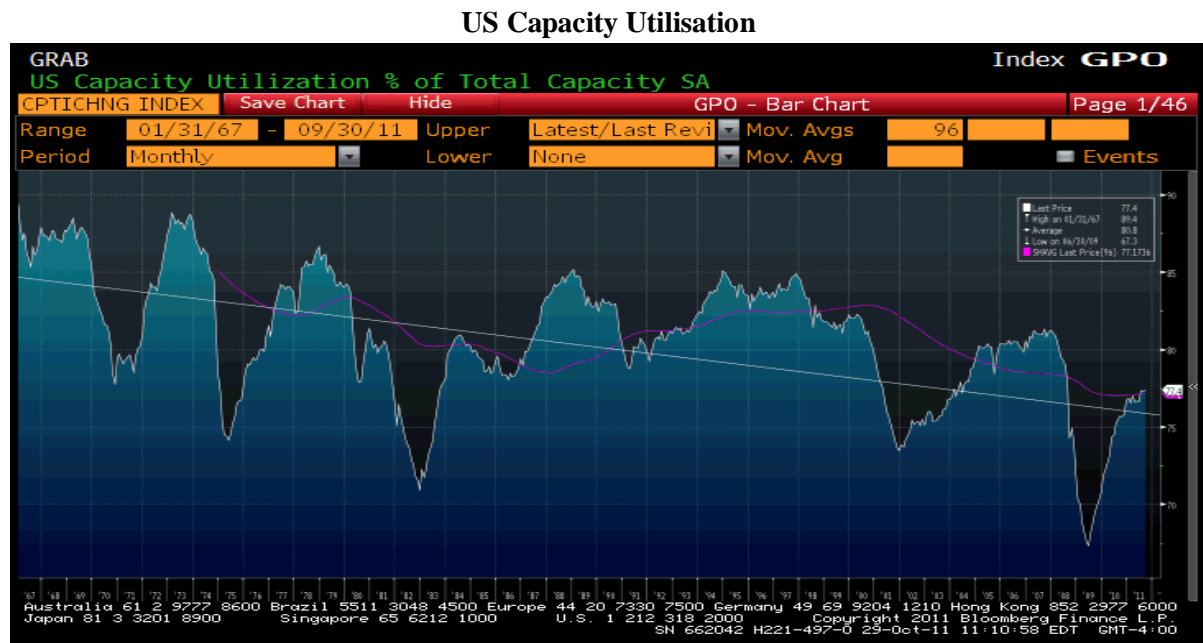
Accounting for Growth: The Role of Physical Work
<http://www.iea.org/work/2004/cewp/Ayres-paper1.pdf>

Since 1973 wage differentials have grown steadily further apart. A common misconception is that computers have replaced the need for manual labour explaining the increased premium for educated workers. Technology absolutely is replacing some low skilled jobs, but the pace of the advancement is no faster than in the past. The widening wage differential is primarily due to a slowdown in the supply of skills rather than a speedup in the demand. The book *The Race Between Education and Technology* says there has been no increase in the relative demand growth of college students in the period 1980 to 2000 over that in the preceding 30 years. Instead it has been a decline in the relative supply growth that helped cause the widening wage differential. There is simply not the supply of educated staff necessary to maintain the marginal productivity of labour, let alone innovation.

The higher premium for educated workers should be used in advancing the technology frontier, but instead, government tax and bank loans have transferred the surplus earnings back to bridge the wage differential. Given that the distribution of the income is not in line with the consumption of the goods, taxation or borrowing has been essential to square the circle. This has added layers of inefficiency, such as the tax collectors, accountants and bankers needed to process the tax or debt and keep the whole imbalanced structure together, reducing still further the factors of production available for innovation. The larger the transfer the more resources are wasted in facilitating this misallocation of capital, which in turn causes further distorted signals. As debt is rising relative to GDP, it will eventually have to be defaulted on and any income that was previously recorded as profit will end up being written off. Profitability without productivity can only ever be a temporary phenomenon. Ultimately it is illusory and unsustainable.

It is absolutely true that long term profits cannot ultimately grow unless they are partnered with near equal benefits for labour, but equally it is true that over time labour cannot consistently consume in excess of its productivity. The same is the case with capital. Growth in debt or taxation relative to GDP distorts the pricing signals between all factors of production, including innovation. This not only leads to stagnant total factor productivity and therefore sub-optimal growth, but eventually

bottlenecks and shortages, resource depletion and finally economic contraction. Whilst capacity utilisation may have fallen steadily over the last 40 years suggesting an output gap, in reality it reflects capital being deployed unproductively and thereby a cost to the rest of the economy. More of the same capacity is being added rather than inventing new ways and new industries to use it. The advancement in technology is insufficient to offset the consumption of resources, revealing the output gap as more apparent than real. Yes there is plenty of spare industrial capacity, but even at these low operating rates there is insufficient energy on which to run it. In the long term the only sustainable distribution of money and wealth is in line with productivity and the only way to sustain and grow that wealth is through innovation.

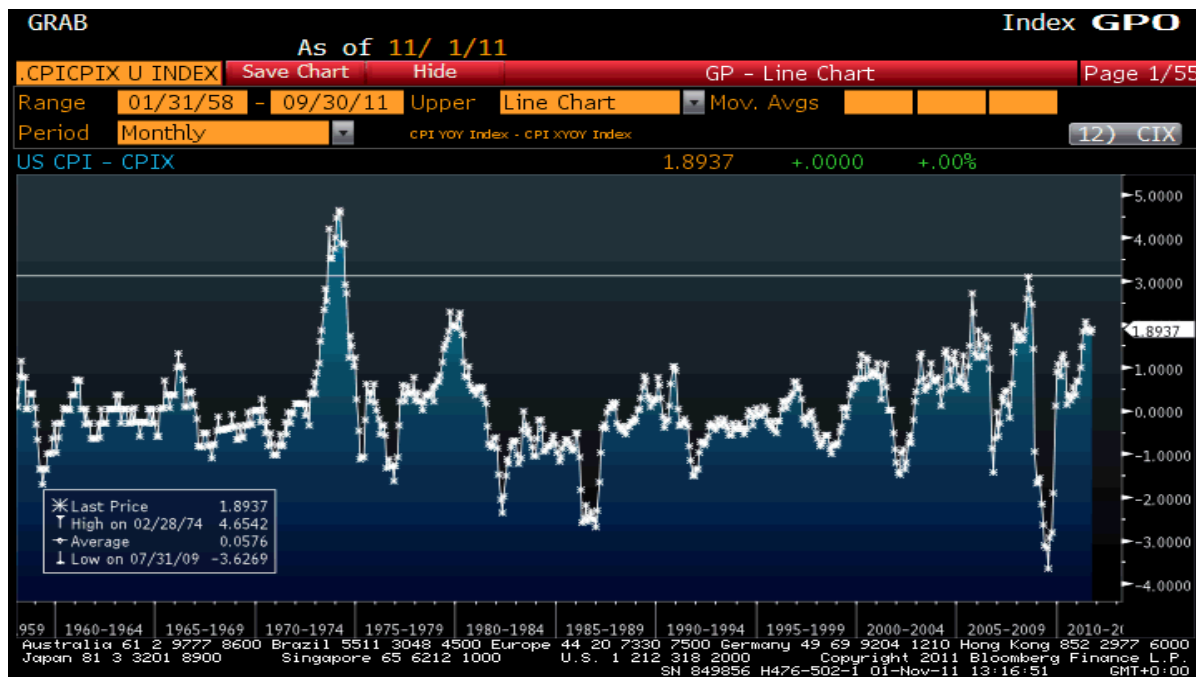


Why can't the illusion go on for ever? Why did debt become unsustainable in 2007/08 when it had been serviceable only the year before? Debt is not the problem per se. It is the misallocation of capital that it represents that is important; excess consumption or industrial capacity depending on which side of the ledger you are looking versus the energy available on which to operate it. By 2007/08 these imbalances or bottlenecks in the system showed up as large price increases of food and energy. To be fair this had already been appearing in 2005/06 when some of the very marginal markets like Pakistan had started to be priced out, but by the following year these bottlenecks were sufficiently serious that the sub-prime US consumer was also unable to meet its bills, the consequences of which were all too obvious. The situation is even worse than the chart above would suggest as this only shows US excess industrial capacity, but imagine just how large the figure would be if you looked across the Pacific to Asia, and in particular China, and the huge trade surplus that it runs with the rest of the world.

Economists focus on broad inflation, but relative prices are just as important. In July 2008 the spread between US CPI and US CPI excluding food and energy reached its highest level since the 1973/74 Middle Eastern oil embargo of the United States of America, indicating a significant imbalance between the relative supply and demand of different goods. The tightness in supply relative to demand implicit in these prices had only ever been achieved before as a weapon of war. In a free and flexible market, the pricing signals would cause a reallocation of resources in a relatively smooth manner before such extremes had been reached, but as you can see below, the problem had been building for a

number of years as government and central bank policy fought the rebalancing that was needed. In the end the spike in commodity prices and the consequent catastrophic collapse in demand and restructuring of the economy were inevitable. Unfortunately as you can see, despite the huge monetary and fiscal response from the authorities, imbalances remain, leaving us in a stretched position.

US CPI minus CPI excluding Food & Energy



The implicit oil & food shortage remains as bad as during the 1979 Iranian Revolution

Where economists go wrong is to assume that these imbalances will sort themselves out, when in reality the fiscal and monetary medicine they prescribe adds still further to the misallocation of capital. The closure of excess capacity, the shedding of staff and the reduction in standard of living that economic policy tries to avoid, is in fact the cleansing that the system needs. When economists talk about debt as borrowing from the future, this is simply not the case. We can only borrow from the present, however assuming debt is rising relative to GDP, and capital is therefore being misallocated, we are depleting the factors of production that could otherwise have supported future output and innovation. Keynesian stimulus that adds debt relative to GDP is therefore not only a tax on today's productivity but also on future growth. Given the accumulation of debt over the last 40 years it should not be a surprise therefore to understand that US GDP would have been 51% higher than today had total factor productivity growth continued on its pre-1973 trend.

It is not my purpose here to say what particular uses of capital are productive. Building bridges to nowhere in Japan is clearly wasteful, but equally bringing US bridges and other infrastructure up to a safe standard may support productivity. Building huge amounts of industrial capacity and modern homes in China may boost today's growth, but with the stock of housing relative to GDP rapidly approaching Japan's bubble levels and resources in rapid decline, sustaining output is not assured. No

one wants to be wasting money, and clearly a lot of analysis goes into economic decisions, but until investment has been made we simply don't know whether it will end up productive or not. The return may also not be immediate in which case debt rising relative to GDP may temporarily give false signals, but clearly 50 plus years of debt growing in excess of GDP indicates a problem. The ideal indicator of a projects success or failure would be the net present value of the debt relative to the net present value of future GDP, but without the benefit of hindsight we have to rely on pricing signals. Removing distortions, which means shrinking government, is therefore essential.

Debt and taxation have historically been associated with wars. It is an allocation of capital that we are prepared to make, and if the war is successful the debt may be repaid quickly as the victorious country will have access to factors of production it didn't previously have. The huge technology gains in WWII for example opened up new resources, and new industries in which to utilise the factors of production that had previously been lying idle before the war, rapidly reducing US debt relative to GDP. Even with a war however, the misallocation of capital cannot go on for long before bottlenecks rapidly build up undermining the economy's ability to sustain the fight. Unproductive fiscal stimulus and social transfers can only be temporarily absorbed before they become self-defeating, slowing the economy and raising the cost of capital.

The mainstream economic argument against austerity and in favour of fiscal stimulus today is that without the stimulus, GDP would fall and outstanding debt would rise even further on a relative basis. This is shallow nonsense. If debt rose by 10% relative to GDP last year to reach a ratio of 200%, then the sustainable GDP is around 90 not 100, and debt to sustainable GDP is 222% not 200%. Allowing the system to clear itself simply recognises the true figures and allows the freed up resources to be used more productively. Without the burden of supporting the misallocated resources, the sustainable GDP should start to rise relatively quickly, gradually reducing the cost of servicing the debt and eventually the debt itself. As it is the push for governments to borrow more to support the continued misallocation of capital makes no sense whatsoever. It simply delays recognition of the true sustainable situation making the inevitable correction that much more severe in both depth and speed when it comes.

Unwilling to accept the political consequences of allowing debt deflation to clear the economy of the misallocation of capital, governments are condemning those same economies to the slowdown and collapse they are trying to fight.

Chapter 7. Papering Over the Cracks

Financial engineering or financial innovation, also referred to as *computational finance* is the rather grandiose title given to new ways to grow debt. More precisely it “is a cross-disciplinary field which relies on computational intelligence, mathematical finance, numerical methods and computer simulations to make trading, hedging and investment decisions, as well as facilitating the risk management of those decisions” according to Wikipedia. Mathematical models are used to combine risks in different ways and thereby allow banks and other financial institutions with a limited capital base to carry a bigger portfolio of debt without apparently adding to risk. In reality it is the financial or statistical tool that allows someone to kid themselves they have lower risk than is really the case, and thereby allow them to sleep at night.

Combining risk in a different manner can help an individual portfolio, but given that it cannot reduce the risk for the economy as a whole, it must be taking on additional risk that it perhaps does not understand. It may for example have reduced risk to the issuer directly but increased risk to other counterparties it had no obvious exposure to. One very relevant risk that has been all too evident in recent years and is generally ignored is regulatory risk where rules are simply changed. Nevertheless, fooled by their self-belief, banks increased their loan portfolios and lowered their capital ratios, seemingly not understanding the simplest aspect, that higher debt relative to GDP increases systemic risk.

Given that “once in ten thousand year events” are happening on a fairly frequent basis, you would have thought that the financial industry would recognise that their models are simply wrong. Not a chance. In 2007 the US sovereign yield curve inverted. This has historically indicated imminent recession as it reflects the unprofitable deployment of capital. Despite this US Commercial Banks continued to expand their balance sheet, locking in losses and taking their cash levels down to a record low of just 2.68% of their assets. This was madness, so what was going on?

The implication is that the senior managers at the banks were totally out of their depths and simply had no idea of the true nature of their risk. The frequently used excuse is that banks had become so big that no one could possibly understand the risk they had on board. This is nonsense. The reality is that the management was exactly that required to implement government policy in the preceding years. If they had understood the risks they would simply not have taken them. They would not have made the supra profits and would therefore have lost their jobs and been replaced with people that didn’t understand the risks. The market got the quality of management that was required to implement government policy in just the same way that the deterioration in broader education level reflects the misallocation of capital associated with the economic policy of the day.

Of course there are exceptions to this. There are some brilliant asset managers who not only understood the risks, but also understood the broader picture and that until bottlenecks appeared, in this case in terms of resource prices, they were better to be inside the Ponzi scheme than outside it. They made money on both the formation of the bubble and its bursting. If everyone had understood that a bubble was being created, the risks would simply not have been taken, slowing economic growth and forcing desperate governments who rely on that growth for re-election, to stimulate the economy even further. The build-up of debt and associated risk was simply the cost that government was prepared to take to remain in power.

Bank lending is either explicitly or implicitly directed by government. Under a fiat money and fractional reserve banking system, the central bank is effectively the puppet master, pulling the strings

to the banks and thereby to the broader financial industry. As with any marionette the moves are somewhat exaggerated, delayed and not obviously what was intended with the puppets seemingly having a mind of their own, but this is not the case. The central bank is in charge and the commercial banks simply respond to the signals given. Unfortunately this seems to have got lost somewhere in recent years with for example various members of the Federal Reserve denying that it is their job to identify and pre-empt the asset bubbles being caused by the printing of money which ultimately they control. Quite frankly they seem to have fallen under Walt Disney's spell, believing their puppet has become real and able to operate independent of the central bank's control which is simply not the case. As for the banks themselves, they will always lend as much as they can under the regulations and central bank liquidity available at the time.

The paper *Governments as shadow banks: The looming threat to financial stability* – (<http://www.federalreserve.gov/events/conferences/2011/rsr/papers/Acharya.pdf>) says “Governments, however, typically have a short term horizon and adopt policies that often create excessive current intermediation – a “large financial centre” – at the expense of future costs of financial instability. For example, in pursuit of short term popularity, governments can encourage competition in the financial sector, provide downside guarantees, weaken risk controls, subsidise leverage through tax deductions, and direct lending to specific sectors for populist goals. This way governments operate as “shadow banks”, exploiting intermediation activity for private objectives, the end result of which is often fuelling credit booms and periods of intense economic activity but with a looming threat to financial stability”. “Finally, competition and government guarantees may exacerbate not just the level of risk in financial firms’ portfolios, but also the level of their leverage in order to enhance the size of their gamble even further, but at little private cost since leverage costs do not rise substantially with risk due to guarantees”.

The growth in the financial sector relative to the rest of the economy is reflective of the misallocation of capital. Whilst understandable that it is pilloried by the public, its growth is instrumental to social democracy, providing the vital infrastructure on which to finance budget deficits and spending programmes. The misallocation of capital is symbiotic to the growth in the banking industry and fiat money, themselves symptomatic of government policy. It is not the banks that are to blame, but rather the ambitions of government are out of tune with the reality of the economy. It is the gradual move to bigger government that is the real cause of the collapse in total factor productivity and the build-up of debt.

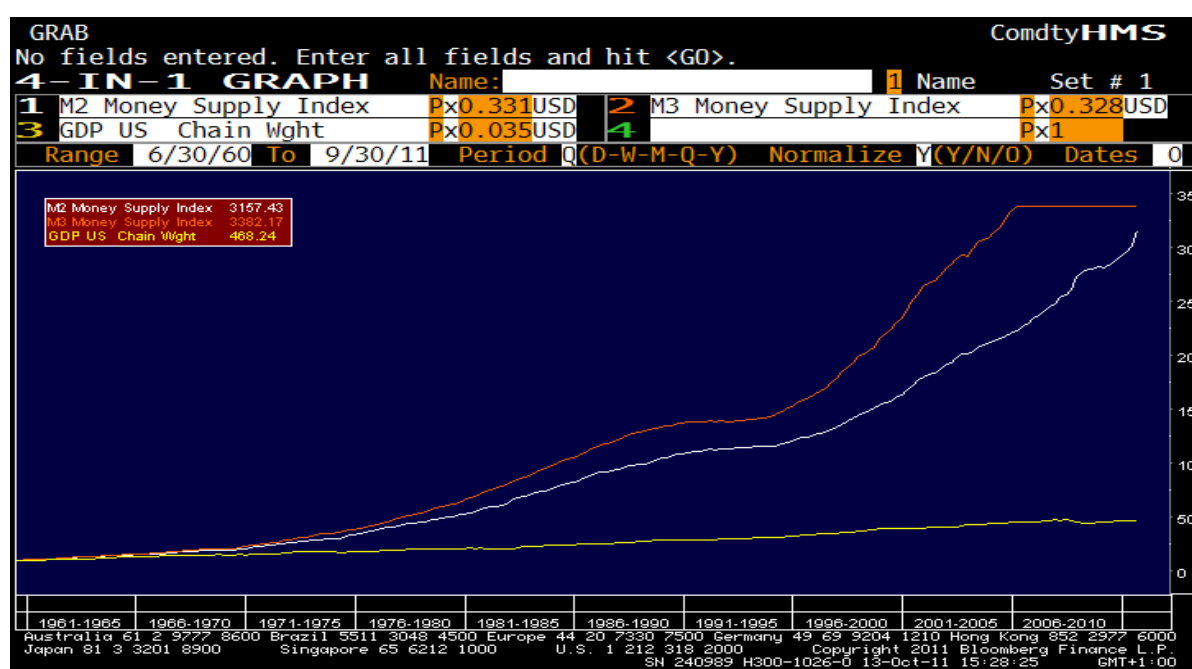
Governments are always willing takers of credit because it allows them to fund legislative priorities. Consumers are willing borrowers whilst they can use the money to improve their near term standard of living. With government, household and corporate debts equalling bank assets, the banking system has an incentive to continually expand their balance sheet regardless of the borrower's creditworthiness. As a client says, “When a bank makes a loan there is no incentive for it to ever be repaid, by creditor or debtor”.

Governments have burdened industry with increased layers of compliance and other legislation that not only adds to costs of business but also steers where capital is used. Since the crisis started to unfold, government control has become more explicit. Rather than just relying on commercial banks to do their bidding, central banks have bought vast quantities of assets directly, particularly their own sovereign paper. Similarly increased government spending has offset any slowdown from the private sector. The tax on productivity is becoming more and more extreme and so therefore the financial innovation, capital controls and monetisation necessary to keep the system together. Most worrying of all is that within banking, intellectual and inspirational capital have also effectively been taxed or

smothered by the puppet master determining that the only game in town was finding different ways to leverage, initially the private sector's balance sheet, and more recently its own.

From August 1971 when the US abandoned the gold linked standard or Bretton Woods System until October 2011, M2 money supply growth expanded 14 fold compared to a 3.1 fold expansion in real GDP. When the broader M3 was abandoned as the main monetary measure in early 2006 it was already 14 times larger than in August 1971, and judging by www.shadowstats.com's charts, it has expanded a further 40% since. Through monetary policy and through its function as lender of last resort, the central bank not only allowed commercial banks, but effectively required them to expand money supply and take their capital ratios down to extreme lows.

US real GDP has growth has severely lagged monetary growth



The August 1971 US abandonment of the Gold Standard, terminating the convertibility of the dollar to gold meant the dollar became a full fiat currency. Because the US dollar is the World currency dominating settlement of all international trade, finance and capital, the US authorities were able to exercise the same exorbitant privilege from printing money on the rest of the world as they could on their domestic economy. As a client wrote, “Conceptually and now practically, a fractionally-reserved lending system combined with an uncollateralised currency allows governments, central banks and private banks to issue infinite credit to themselves”. The misallocations of capital have extended beyond the domestic shores to the international arena, allowing imbalances – both debtor and creditor - to form and cumulate to the unsustainable levels we see today.

Since 2008 the central banks have printed the money themselves with for example the combined balance sheet of the US Federal Reserve, the ECB, the BoE and the BoJ expanding by USD4.2trn up until October 2011. The financial engineering has moved from the private sector to the public sector with all new-manner of products, vehicles and lines being set up or utilised to try and access savings

and stop the misallocation of capital from unwinding with all the obvious consequences, but eventually it must.

Interbank lending allowed banks to reduce their capital ratios under the belief that an industry wide bank run is far less likely than an individual run. If one bank deploys its capital more aggressively to take advantage of this, then it puts it in an advantageous position. Unfortunately by all banks taking advantage of this and following the same route, the capital ratio of the industry as a whole falls, introducing systemic risk. Now a bank run potentially brings the whole system down, and yet prior to 2008 risk managers simply dismissed financial sector debt as double counting. Similarly by moving risk off-balance sheet banks were able to lower their effective capital ratios even further without having to account for the risk they were taking. All the time that banks were printing more money, they were distorting the allocation, ownership and the use of the factors of production, but it was essential to stop the economy tipping over and the misallocation of capital being recognised for what it was.

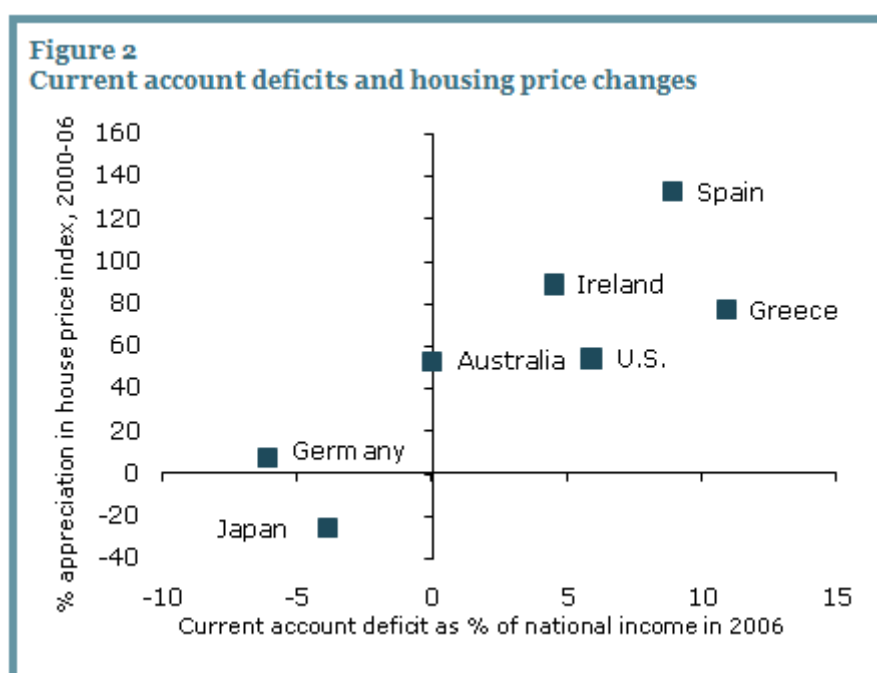
Banks could only lower their reserve ratios and keep this bubble from imploding if the central bank acted as a lender of last resort, expanding its balance sheet and providing the private sector banks with adequate liquidity. This could never have happened on the Gold Standard. A fully elastic fiat monetary system was essential to sustain the unproductive use of capital. If this is so bad, why on Earth was it allowed to happen? The answer is very simple; the government needed it to happen. The end of the Gold Standard and the full adoption of fiat money was the essential to the embracement of social democracy, or the unproductive use of capital that is government policy today.

Printing money does not create new output. It simply changes the ownership of that output, and thereby changes the terms of trade between different goods and services and more importantly between productive and unproductive capital. Misallocating capital in this way must have a natural limit before the returns are insufficient to support the growing mountain of debt and the economy falling of its own weight. To sustain the misallocation of funds and avoid the inevitable losses, banks have to continue increasing the supply of money, but they can only do this by lowering their reserve ratios. As more money has to be created simply to service already outstanding debt, the purchasing power of a wage earner's dollars will diminish changing the terms of trade between goods offering different marginal utility.

For monetary and deficit expansion to stimulate the economy as the government desires, it has to distort the way in which the factors of production are used. Printing money has no direct impact on economic output, but without full information and with relatively slow transmission systems, it can temporarily confuse people into thinking they are wealthier than they are and thereby temporarily boosting consumption and GDP. This extra spending, based purely on incorrect information, can prompt consumption to increase and companies to invest in capacity where there is no end demand once the increased money supply has been reflected in prices.

In the UK and US for example, the money supply increasingly went into property prices, fooling some into building new properties as investments to make a quick buck, whilst encouraging others into thinking they had more wealth, which they then spent through mortgage equity withdrawal programmes. Either way, labour, capital and resources were deployed where they were not needed had the false pricing signals not been given. Not all the capital stock that was created will be wasted, however without the monetary stimulus; the return on capital it offers will be significantly different, perhaps resulting in forced change of ownership and increased debt.

The paper, *Asset Price Booms and Current Account Deficits*, published on the Federal Reserve Bank of San Francisco's web site – (<http://www.frbsf.org/publications/economics/letter/2011/el2011-37.pdf>) - goes one stage further, linking the asset price bubble to the growth in debt incurred specifically through the current account deficit. *Wall Street Pit* analysis – (<http://wallstreetpit.com/87268-house-prices-and-current-account-deficits>) – highlights that the rising asset prices are necessary to give the consumer the collateral against which to borrow to finance the deficit, but unfortunately the rising property prices then cause a reallocation of an economy's productive resources away from manufacturing and into construction. In his monthly newsletter a client writes that the workings of our fiat monetary system are clearly inequitable, with leverage marginalising real growth and the production of capital and sustainable wealth.



<http://www.frbsf.org/publications/economics/letter/2011/el2011-37.html>

If lucky, the changing of the distribution of wealth may prompt someone to use the capital more productively, but that would be more luck than judgement. If someone has a great product or great idea, he should be able to find capital whether money is being printed or not. In fact in a stable money supply system, capital should be allocated far more efficiently, because information is much cleaner and it is simply about competing for capital with the best product or idea. Interest rates should be set by the time preference for goods and services as determined by a free market, not by government priority for re-election. Artificially lowering the price of money supports excessive consumption, zombie companies, and bridges to nowhere. It misallocates limited resources raising their cost for productive and sustainable uses. Unfortunately as I said earlier, perhaps the most worrying aspect of misallocating capital is the effect it has on ideas, individualism and free thinking.

When a central bank or government puts money into the system, it invariably tries to put it to work through the poor who it thinks have higher multipliers, but of course this is not the case. The inflation it causes taxes the poor more than the wealthy, and thereby locks them deeper into the poverty trap in

just the same way as lending Greece more money today ends up costing it more in terms of raising the cost of capital. Anyone that has read the book *The Economic Hit Man* will understand exactly what I mean. The poor have to sell their services at cheaper and cheaper rates to cover the cost of servicing debt, but minimum wages frequently makes this impossible. The rich on the other hand have access to tools to negate the effects of the inflation, but with 45 million Americans now on food stamps, more and more people are falling into the government's poverty trap. Whilst government and consumers are understandably willing borrowers to boost near term consumption, unless that debt is accompanied by at least as much growth in GDP, than that short term high will come at the expense of a much deeper low.

The paper *Governments as shadow banks: The looming threat to financial stability* – (<http://www.federalreserve.gov/events/conferences/2011/rsr/papers/Acharya.pdf>) suggests that governments have short term horizons and are focussed excessively on the current level of economic activity, ignoring the impact of policy on long term growth or stability. By allowing downside guarantees through their role as lender of last resort, which is an essential element in a fiat money system, they “create periods of intense economic activity fuelled by credit booms” creating the appearance of growth through the short term misallocation of capital that has no choice but to eventually implode. “Such government role appears to have been at the centre of recent boom and bust cycles and continues to present a threat to financial stability”.

Those of us employed in the derivatives industry should recognise the asymmetric risk profile that a fiat money system or of social democracy provides has an associated cost in just the same way as call or put option. The cost or “premium” in this case is the misallocated capital, which guarantees the economy will underperform in all periods other than large corrections. On the face of it, lower growth may be an acceptable price to pay, but just how much lower growth? A listed option has a specific maturity because the cost would soon mount up, making the protection prohibitively expensive for anything but the very short term. With the central bank managed option, there is no maturity, meaning the cost simply accumulates up through ever greater misallocation of capital until eventually the economy has been “taxed” so heavily that the protection the fiat money provides is worthless and the system has no choice but to clear.

Printing money does however have one obvious winner; the financial sector. Increasing the money supply has no direct impact on the output of the economy. There is simply more money against the same amount of GDP, but because the new money originates at the banks, they can use it to acquire assets before full-knowledge of the extra money supply has filtered through into higher prices. It is a Ponzi scheme. As long as the banks can add to the money supply, they can gain ownership of the real assets through the simple printing of money, effectively taxing both the real economy and productivity. A feedback loop requiring ever more monetisation to offset the slowing productivity growth ensues. How ironic, the person making the sarcastic remark that going long gold was a losing trade because it was shorting US inventiveness, was spot on, and describing the failure of fiat money.

The United Nations Conference on Trade and Development's (UNCTAD) *Trade and Development Report 2011* highlights that whereas entrepreneurs are concerned with the creation of new real assets that have the potential to improve productivity and thereby increase all future incomes, financial market participants primary interest is in the use of information to gain control over existing assets. The most powerful information relates to monetary expansion rather than developments of the real economy, often resulting in seemingly irrational asset prices. The financial market itself therefore create the information flow that drives asset prices in general, distorting the allocation of capital and concentrating the ownership of in the financial market's hands.

The Curious Capitalist reports that “A new study from the Kauffman Foundation that researches and funds entrepreneurship, has found that over the past several decades, the growth in size and importance of the financial sector has run in tandem with lower – not higher – rates of new business formation. In the 1980’s, when Wall Street really took off, the number of new firms created fell, and in the 1990’s, it plateaued and has been stagnant ever since”. The Fed’s cheap monetary policy of the last 30 or 40 years has meant it has been far easier to make money playing financial markets than real markets. That in turn has meant that Wall Street has sucked an ever increasing percentage of graduates and top talent into financial innovation and away from real innovation. Harvard graduates for example enter financial occupations at a far higher rate now than they did in the 1970’s, a trend that markedly accelerated with the mathematical or quant approach to financial markets and derivatives. “The problem is that these are the sort of people that are most likely to start the sort of dynamic, job creating new companies that the US needs. No wonder economists like Nobel laureate Edmond Phelps speculate that the financialisation of the US and subsequent dampening of entrepreneurship may be at the heart of the country’s long term productivity slowdown”.

A frequently heard comment in the press today is that banks have become too big to be allowed to fail. Whilst absolutely correct, the far more worrying aspect is that they have actually become too big for the economy as a whole to succeed. One of the criticisms of Communism is the failure of central planning, and yet this is exactly what has happened to our own markets as the dominant financial industry determines how and where capital is deployed. Short term investment is favoured over long term investment. Whether communism, socialism or monopolies, they all consume rather than produce capital; they are all a tax on productivity and therefore cannot survive; they are self-defeating.

Let’s not kid ourselves; the main reason for the government printing money is to buy votes with the temporary feeling of wealth it creates from the distortion and misallocation of capital. Governments think they are creating jobs, but “on balance these jobs diminish the economy by wasting scarce land, labour and capital” – (<http://news.goldseek.com/EuroCapital/1315932677.php>). This is clearly a massive problem with today’s “democracy”. The mistrust of government is justified, but it means policy is aimed squarely at short term stimulus and re-election. Sir Alex Ferguson, the incredibly successful Manchester United football manager recently said that because no-one will sack him, he can invest for the long term good of the football team. He does not need to sacrifice the future for immediate results. Unfortunately this is exactly what politicians, economists and even corporate management do. The innovation and total factor productivity increase necessary to get us out of the present mess can only come from allowing capital to be rewarded correctly for its efforts, but how can that happen when the system of democracy itself gives everyone an equal vote even though they are not equal within the economy. Government priorities are re-election, and it is far easier to buy the public’s votes with pay-outs today and ignore or lie about the future consequences.

Today’s social democracy is effectively a system of taxing productivity to transfer to the unproductive. It is a fight to ruin; it is communism or the Tragedy of the Commons all over again. Fiat or paper monetary systems are not intrinsically bad, but their only real virtue, that of an elastic money supply, is also their greatest flaw according to the book *Paper Money Collapse* by Detlev Schlichter. The end of Bretton Woods, the printing of money, the adoption of social democracy all explains the financial crisis we are in today and the stagnation we face tomorrow. In an article in the Wall Street Journal - (2nd – 4th December 2011) - entitled Fiat Money in Crisis, Mr Schlichter says that in a heavily regulated system in which the public sector routinely spends as much money as all private individuals and corporations put together, we are so far from a free market that no eminent economist of previous generations could possibly call it capitalist. “The era that deserves most to be associated with the term laissez-faire coincided with the classical gold standard of 1881 – 1914, when the

industrialised world based its financial system on gold, a metal of essentially inelastic supply. This put clear limitations on credit creation, tied lending to savings and imposed prudence and accountability to the financial dealings of states and banks. This was a period of growing international trade, rising living standards and monetary stability”.

Even the Bank of England accepts that against a range of metrics, today’s international monetary and financial system has performed poorly, at least relative to the Bretton Woods gold-linked standard. “The current system has coexisted, on average, with slower, more volatile global growth, more frequent economic downturns, higher inflation and higher volatility, larger current account imbalances, and more frequent banking crises, currency crises and external defaults”. http://www.bankofengland.co.uk/publications/fsr/fs_paper13.pdf. Replacing the flexibility demanded of factors of production – ie *creative destruction* - with the flexibility of a printing press will clearly reduce productivity growth. The supposed trade-off of reduced economic and social volatility could never happen over anything but the short term as the accumulation of misallocated resources that the printing of money infers, ends up adding to volatility rather than suppressing it.

Whilst the fiat paper system is clearly sub-optimal, and government and central bank policy is a major drag on the economy and therefore our standard of living, are the governments too heavily committed to this path of destruction that there is nothing they can do? Should we expect banks to continue taxing us and governments to continue buying votes by misallocating resources and creating unsustainable jobs? Whilst economists tell us we are on a fiat monetary system, the reality is only up to a certain point. Beyond that we are on a resource system. Whilst the central banks can print more money, the factors of production have been allocated so badly that bottlenecks mean there is little or no margin left any more to create even a short term burst of growth. The misallocation of capital has become so extreme that printing more money will increasingly result in stagflation. Whether governments like it or not, resource constraint means the economy has to restructure and rationalise. With commercial fusion at least 10 years away, and the deficit in energy supply likely to get significantly worse over that period, governments would be far better to accept the reality and manage that adjustment rather than continuing on their present path.

The real economy is now naturally compelled to de-lever. Whilst economists and politicians argue this is best achieved through the printing of money as it is far more socially and politically expedient, avoiding rising unemployment and bankruptcies, they are missing the point. The debt is simply a financial representation of the misallocation of resources. Printing money and handing it to the debtor would still not solve the problem, merely rebasing the level from which the debt continues to accumulate. Unfortunately with severe shortages and bottlenecks in the system now prevalent, the only way forward is to clear not only the debt but the real economy underlying it. Printing money and re-leveraging the system will have an increasingly marginal impact on short term growth and will come at the expense of the future economy. The argument that economic contraction must be avoided at all cost so that outstanding debt does not become even more of a burden lacks any merit. The debt represents misallocated capital and therefore must be written off.

Socialism, Communism and Social Democracy are names given to various forms of economic ideology that transfer wealth from the individual to the wider economy. Their very definition is about transferring and thereby misallocating resources. They need paper money systems to allow the political system to function. Productivity requires the factors of production to be flexible and willing to adapt to new jobs to drive growth. Under a fiat system where the central bank acts as lender of last resort, the flexibility is provided by the money itself. Rather than moving the factors of production to their best use, the fiat system simply over-rules and distorts the pricing signals, transferring money and credit instead. The system taxes productivity and rewards inefficiency.

As a child I was always told that the easiest way to make money was to be in an industry where money was the main product, ie banking. Over the last 40years, since the end of the Gold Standard this was clearly correct, but it is increasingly obvious that for the economy to heal itself, both banks and government have to shrink as a percentage of the economy. If they don't, it can only be because the rest of the economy is shrinking under the burden of supporting this unproductive superstructure. Unfortunately I don't expect this to happen via clear thinking and a smooth reversal in policy, but rather as a consequence of continuing down the same path to a turbulent conclusion.

Chapter 8. The not so Free Market

The financial industry's growing might has driven the capital structure of the economy. The printing of money has enabled it to shape industry to its advantage. Its assets are someone else's liabilities. It has used the expansion of its balance sheet to encourage and force mergers, strip costs and leverage the corporate world both financially and operationally. We like to think we are living in an economy where outcomes are determined by a "free market". They are not.

In an article in Harpers magazine - <http://harpers.org/archive/2006/07/0081115> - Barry Lynn, author of the books *End of the Line: The Rise and Coming Fall of the Global Corporation*, and *Cornered: The New Monopoly Capitalism and the Economics of Destruction*, argues that we increasingly find ourselves in a world dominated by immense global oligopolies and monopolies that increasingly limit the flexibility of both the economy and of our personal freedom within it. The tendency has been toward ever more extreme consolidation; "Owens Illinois has rolled up roughly half the global capacity to supply glass containers. ...General Electric builds 60% of large gas turbines as well as 60% of large wind turbines. In processed materials, Corning produces 60% of the glass for flat screen televisions. Even in sneakers, Nike and Adidas split a 60% share of the global market. Consolidation reigns in banking, meatpacking, oil refining and grains. It holds even in eyeglasses, a field in which the Italian firm Luxottica has captured control over 5 of the 6 national outlets in the US market". Markets have been turned from places of competition, pitting supplier against supplier and worker against worker, into a kind of private property right. The printing of money combined with the inadequate anti-trust regulation has perverted the free market itself.

Even more worrying is the mirror image of monopoly known as monopsony. The Consumer Goods Pricing Act of 1975 repealed the so-called fair trade laws enacted in 1937 and 1952 that determined that prices would be set by manufacturers rather than retailers. Competition between manufacturer and product was replaced with competition between retailer and price. When a firm captures the ability to dictate price to its suppliers such as Wal-Mart, which accounts for 20% of all US retail sales, has revenue equal to the next 6 retailers combined and plans to double its sales within the next 5 years, "it deprives the firms that actually manufacture products from obtaining an adequate return on their investment". Over time it destroys the machines and skills on which we all rely, sucking capital and innovation out of the economy and replacing choice, wealth and culture with blandness and poverty. Without true pricing signals that a free market system would give, there is nothing to determine where capital is most needed. Rather than driving productivity, the system simply strips costs that are not associated with today's production of the core product. Diversity disappears whilst research and development is sacrificed at the altar of lower price and higher market share.

The benefit of a monopoly is cheaper production, but the cost is loss of choice and the elimination of competition and innovation. Outsourcing is about cost arbitrage rather than productivity. It is perfectly reasonable if the saving is re-invested in research and development, but otherwise it is a cost to the broader economy. As with a lot we have heard so far, a monopoly offers a time preference of cheaper goods today at the expense of slower advancement and therefore relatively more expensive goods tomorrow. "We have programmed the dominant institutions within our economy to eliminate all the wonderful chaos of a free-market system. Rather than speed up the random motion and serendipitous collisions that have for so long propelled the American economy" we have put the economy under the rigidity of a centrally planned system. We have embraced rationalisation to the point of complete

irrationality. Capital has been misallocated, education and innovation has stagnated and the illusion of growth has been at the expense of consuming down the balance sheet. I would wager that this explains the loss of pride by many people in their job and their increased unhappiness as they become little more than battery hens.

By replacing competition with monopolies, not only have we reduced the choice and diversity of product, but so too the choice and diversity of leadership. Rather than 50 firms and therefore 50 CEO's competing for a share in a particular market, there are probably no more than 3 or 4 genuine contenders with perhaps an additional 1 or 2 niche players. Distributing an industry's earnings in fewer hands has resulted in the average American S&P 500 CEO's compensation rising from 26 times that of the average worker in 1965, to around 350 times today. With reduced competition amongst the top earners, income has been able to outstrip performance. Between 1993 and 2008 the top 1% of Americans captured 52% of all income growth in the United States; a trend that once again originates in the 1970's and reflects this concentration of power in fewer hands. This article – (<http://www.kykloproductions.com/articles/wages.html>) - suggests total compensation growth has been even more extreme, but it seems to have copyrights on so I will leave you to look at that directly.



<http://www.aflcio.org/corporatewatch/paywatch/>

The concentration of income in fewer hands reduces diversity of product, of leadership and therefore of ideas. Competition, research and development, innovation and new product are sacrificed to cost cutting. Efficiency gains are often at the expense of economic safety, increasing the level of interdependence and therefore raising the level of risk. For the economy as a whole, competition is insurance. Removing that as we have done, opens the economy up to contagion and cascade risk and an increased reliance on central banks and governments providing protection through lower and lower interest rates, the printing money and fiscal stimulus. Unfortunately such financial innovation and insurance can only temporarily achieve the same results as real innovation and competition, and

whilst the latter may appear an expense to be stripped away, the cost is necessary not only for growth and advancement, but also for sustaining output. Efficiency and productivity gains through reduced competition are therefore false gains and come at the expense of an optimal allocation of capital. When analysed over any period other than the short term, the massive growth in CEO compensation has been reward for destroying rather than creating value.

Concentrated market power amounted to “a kingly prerogative” according to Senator John Sherman, author of the first major piece of antitrust legislation in 1890. “If we will not endure a king as a political power we should not endure a king over the production, transportation, and sale of the necessities of life”. Dispersing ownership and maintaining a decentralised economy of numerous small businesses would both ensure healthy competition and be accordant with democratic self-governance. This broad civic purpose faded from anti-trust policy in the second half of the 20th century as courts and federal enforcement agencies began to interpret antitrust laws with a much more narrow focus on prices. Concerns over the dangers of concentrated market power were eclipsed by the conviction that size conferred economies of scale. The two major federal enforcement agencies – the Antitrust Division of the US Department of Justice and the Federal Trade Commission – grew reluctant to constrain the scale of business and to limit predatory tactics that could lead to lower prices, even at the risk of reducing competition over the long term. The result is an antitrust environment today in which corporate retailers can use their size and market power to dictate prices and eliminate competition through barriers to entry – (<http://www.newrules.org/retail/antiprice.html>).

Under the guise of “efficiency” and the “welfare” of the consumer, antitrust enforcement all but ended in Ronald Reagan’s first term. The basic argument was as simple as it was subversive. Given that consumers benefit from lower prices, and given that greater scale gives managers the power to drive down prices, concentration of power should be embraced rather than resisted. Under the threat of competition from Japan it was argued that bigger companies could offer the US more protection. Reagan’s 1982 Merger Guidelines redefined the American marketplace as global in nature, and severely restricted who could be regarded as a victim of monopoly. Only one action could be regarded as truly unacceptable, to gouge the consumer. Everything else was fair game. Waves of mergers and acquisitions followed with little or no resistance. By the time the 2000s rolled around, industry after industry had been consolidated and antitrust enforcement had reached a new low, one consequence of which was that with fewer attractive growing companies to invest in, the plethora of international capital instead found a home in subprime mortgages and other financial exotica. (<http://www.washingtonmonthly.com/features/2010/1003.lynn-longman.html>).

Reagan told Congress “We are changing the way we enforce anti-monopoly, anti-trust laws. No longer are we going to seek to have competition for the sake of competition. No longer are we going to seek to distribute power to prevent the concentration of power. What we’re going to do now is we’re going to allow people to concentrate power because its going to be more efficient and its going to help the consumer in this country. Because of the power that’s concentrated, these guys are going to use it to drive down the price of what we buy, you know, at the store”. The adopted measures successfully lowered prices, but by making price the only determinant of value the cost was reduced choice and increased risk due to the removal of diversity and competition. <http://www.thenation.com/article/159629/transcript-breakdown-are-antitrust-laws-thing-past>

Over the last thirty or 40 years the maintenance of profit and economic growth has been at the expense of competition, innovation and economic safety. Whilst not measured by traditional accounting, these costs have materialised as a huge slump in total factor productivity growth, the depletion of domestic resources, and the consequent need to access factors of production from abroad.

A feedback loop of cost cutting and specialisation without innovation is de-skilling the workforce and reducing the marginal productivity of labour resulting in a race to the bottom. Without innovation, we are consuming down our balance sheet.

Chapter 9. Managing the Decline

On the 5th August 2011 the U.S. rating agency Standard and Poors, downgraded the sovereign credit of the United States of America from AAA to AA+. The downgrade reflected their opinion that the fiscal consolidation plan that Congress and the Administration had previously agreed fell short of that necessary to stabilise the government's medium term outlook. "More broadly, the downgrade reflects our view that the effectiveness, stability, and predictability of American policymaking and political institutions have weakened at a time of on-going fiscal and economic challenges to a degree more than we envisioned when we assigned a negative outlook to the rating". The political difficulties in addressing the fiscal deficit mean the outlook remains negative. "We could lower the long term rating to AA within the next two years if we see that less reduction in spending than agreed to, higher interest rates, or new fiscal pressures during the period result in a higher general government debt trajectory than we currently assume in our base case".

<http://www.standardandpoors.com/ratings/articles/en/us/?assetID=1245316529563>

The downgrade is recognition that the US balance sheet is stretched, and that it is consuming beyond its means. Innovation is not happening sufficiently quickly to create new factors of production, and the sale of existing technology is unable to support present levels of consumption. Rather than productivity strengthening the currency and lowering the price of imports, the dollar has continually declined since 2002 with the exception of the 2008 correction. Having sacrificed the future and accepted sub-trend growth, the cost is now changing from an opportunity missed to a genuine contraction in today's standard of living, making the politics and management of the situation far more complex and dangerous. There is only one solution; to gradually re-align the social and rewards system with a productive economic system, but that means breaking down and reversing pretty much every aspect of modern government and society.

Science seeks the truth, and through this truth the economy advances. It is about asking questions and finding the best solution or explanation. Social systems and transfer payments on the other hand are about telling lies. Politics is a popularity game where policy is negotiated to satisfy a range of different interests, the sum of which may be counter to the good of the economy as a whole. For government to undo the damage of the last 30 or 40 years they will have to re-engage the public with the truth, which means supply side reforms. When a plane stalls, the correct response is to push the stick forward putting it into a dive whilst increasing power to gradually pick up forward momentum and create lift. A similar response should happen with the economy, cutting excess consumption and putting the economy into a dive, but at the same stage investing in the new science and industry to drive growth going forward. The present approach of borrowing more to create demand at all costs is akin to pulling back on the stick to gain height, a rookie mistake that will intensify the stall and put the economy into a vicious spin.

Whilst optimistic that the voting public will eventually force government to change tack, that assumes that different parties will offer a choice of policy. Unfortunately that is a big assumption. The further government has gone down the road of social democracy, the more their reforms have positioned the electorate to vote accordingly. Neither public sector workers nor those benefitting from Medicare and Social Security payments are likely to vote for loss of their own jobs, lower pensions or reduced life expectancy. Other measures such as minimum wages and housing benefits all act to reinforce this downward spiral of an entitlement society. By taxing productivity

to support social programmes, the government has created the public necessary for its own survival, making a feedback loop that is hard to break from within.

Under the Gold Standard a lot of this adjustment would be automatic and therefore out of politicians' hands. It would not be subject to negotiation or electioneering. By removing the economy from the creditor system an element of flexibility has been introduced. Politicians have been able to "soften" the pain of any adjustment process by growing government, printing money and generally intensifying the misallocation of capital. To expect the government to recognise that they are themselves the problem, that they need to shrink and return a lot of their powers to freeing the hand of capitalism, seems highly unlikely. Instead, government will increase their control over the capital and resource markets making the adjustment that much more painful when it does come.

The US savings deficit has increasingly been financed by the resource producers. That may sound strange given that China holds the world's largest pool of FX reserves, but economists fail to recognise that China is a resource producer accounting for 18% of world energy production. It has been the demand for energy that has driven China's growth, not the other way around. In a properly functioning market some of the work done by today's energy supplies would have been invested in the technology to deliver energy both today and into the future at a comparable or better price, however as higher food and energy prices testify to, this is simply not the case; the capital has been misallocated.

China should have suffered from the Dutch Disease. Foreign capital should have come into the country in search of coal, lifting the currency and pricing out exports from other industries. Capital controls and incomes policy enabled China to side step this and keep more of the value of coal domestic to its workforce. Productivity and innovation were replaced with low quality factor mobilisation, with debt and transfer payments balancing the two, but of course these are risks that do not arbitrage leaving a huge cumulative misallocation of capital that must eventually be unwound, bringing devastation to both the domestic and international economies. Again this is something that no government will be prepared to do.

Whilst China is the world's largest energy producer, it is now also the world's largest energy consumer, and is increasingly reliant on imports. Its trade surplus has declined heavily in recent years, a trend that is expected to continue, putting it into a full year deficit by 2012 or 2013 which would drag Asia as a whole heavily into the red. Already the combined US and Asian trade balance is negative. The longer the global misallocation of capital continues, the greater our dependence on factor mobilisation, pushing resource prices ever higher. As the terms of trade change and resources become a larger and larger percentage of the world output, the misallocation of capital and the social democracy that has driven it will eventually fall of its own weight.

The declining wealth will concentrate in fewer and fewer hands, unable if not unwilling to support the excesses of foreign governments. Saudi Arabia's response to the Arab Spring was to increase the distribution of oil revenues to the population, and to actually cut back on investment in new fields and future production. For its budget to balance it needs oil priced around USD90/bbl. Middle Eastern oil production fell 1% between 2005 and 2010 whilst domestic consumption increased 26% over the same period, leaving exports to the rest of the world down by 9.8%. Some of the shortfall has been made up with unconventional liquids such as gas liquids, shale oil, tar sands and ethanol, but as each of these have a higher cost of production, the total factor productivity of fuel output has declined leaving fewer factors of production available to support the rest of the economy, pitting product

against product, worker against worker, and country against country to determine who has control over the remaining assets.

Today's volatility in the economy reflects a titanic battle between the world as it is, a free economy of individuals maximising prosperity in an evolutionary or Darwinian race, and the unsustainable system of misallocating capital and consuming the balance sheet that is government policy. The fact that volatility has risen is a clear indication that the central bank and government is losing its effectiveness and that the free market is gradually re-imposing itself. The "Great Moderation" in which the economy changed from one based on earned income to one based on paper movements without creating productive wealth is coming to an end. The replacement of real innovation with financial innovation has gone as far as it can. Given that commercial nuclear fusion is at least 10 years away and that resource constraint will intensify over that period, efforts by government to stop the free market re-imposing itself will get ever more extreme. (<http://www.zerohedge.com/news/central-planning-update-theory-and-practice-you-are-here>).

Essentially we are seeing a fight between productivity & value, and social distribution to win the competition for resources. In 2008 excessive US consumption started to be priced out, and now it's the turn of southern Europe. Whilst these Western economies have been extravagant, consuming beyond their means, their wealth positions them far better to absorb the pain of adjustment than the developing economies. Whilst Greece is seen as a basket case at the moment, its 2011 per capita income is reported at USD27,843 compared to China's USD8,288 according to Wikipedia and the IMF. It should be relatively painless therefore for Greece to adjust its standard of living to a level where it can compete. A 30% income reduction would still leave them enjoying a standard of living nearly two and a half times that of China. For the United States which has a per capita income of USD48,665 taking a pay cut equivalent to the average Chinese income would still leave them on a very respectable USD40,377, some 8% higher than Germany's present per capita income. It could easily divert some serious money into the kind of basic science and innovation that would be the springboard to strengthening rather than just securing its position as the world's most powerful economy.

Further restructuring is necessary to stop accumulating debt and to be competitive today, let alone tomorrow when the resource constraint will only intensify, but the Western economies are in a relatively good position. Asia on the other hand is different story altogether. China's growth has been factor rather than productivity driven. Now the supply of those domestic factor inputs has essentially peaked, its ability to compete in the international markets for the resources necessary to maintain output, has also peaked. China uses 7 times the energy per unit of GDP than does Germany, so as its net energy imports approach 1/7th or 14.3% of its total; the subsidy of cheap domestic production will be insufficient to compensate for this inefficiency. On a per capita basis its coal reserves are just 50% of the world average and its oil and gas reserves only 6.7%. A similar depletion and degradation of its water and soil reserves again means it is increasingly reliant on imports, and finally of course, its demographic position means the mass increase in workforce relative to the dependent population which has been instrumental to its growth, will now start reversing. The need to relocate industry inland closer to available workers, to shift coal from the most westerly province Xianjing towards the manufacturing power houses some 3000 kilometres away to the east as they gradually exhaust their reserves, and to shift water from the south of the country to the north will all add to China's inefficiency. Not only is the balance sheet of China's factors of production weak, but its quality is also very poor.

India is even worse. Its per capita income is just USD3,608, and it is running an increasingly large budget and current account deficit, its shortfall of coal is growing exponentially, and its aquifers are

near exhaustion. Because of the low productivity of both countries, their sensitivity to changes in the terms of trade between commodities and manufactured goods and services is significantly worse than for the developed economies, and as their dependence on imports grow, this will only become worse.

Whilst forced rationalisation within Europe looks as if it will continue to dominate the headlines in 2012, the next phase is the correction moving to Asia which is already starting to happen. Trade surpluses are disappearing, capital inflows have slowed and in some cases are starting to reverse, and the incremental return on capital is marginal at best. With speculation that European banks will dispose of around USD1trn of Chinese assets, can this shortfall of capital be made up? It seems hard to believe that the private sector will have much appetite for adding capacity in China now its housing stock relative to GDP is nearing the Japanese bubble levels of the late 1980's. Why add to industrial capacity that will be squeezed between higher commodity prices and slowing exports when accounts receivable are already at record levels? The purpose of investing in China has been to access its factors of production, both energy and cheap labour. Now these have peaked and China has moved from a net exporter of resources to a net importer, and looks to be doing the same with its overall trade position, it is rapidly shifting from being a net credit on the global ledger of factor inputs to a net debtor. Growth will have to come from domestic spending financed by gradually selling its foreign exchange reserves.

One other aspect that should be particularly concerning for parts of Asia is that a large proportion of its output is the kind of product with least marginal utility. In a shrinking world economy, it is these products that will be priced out first. As energy is becoming less freely available and therefore accounting for a larger proportion of the economy, capital is concentrating in the hands of both the energy producers and their suppliers. The Arab Spring will change the consumption patterns of the Middle Eastern and North African economies in the sense that wealth will be distributed more widely amongst the population. Nevertheless their spending will focus mainly on food and water, capital goods for the energy sector and for civilian projects, military equipment and security, and luxury goods, most of which are products of the West. Asia is the only continent in the world that has a food deficit, and as it industrialises the deficit is becoming bigger as the productivity growth of agriculture is insufficient to offset the increased call on land, labour and water from industry. Both Europe and the United States export food, with the US grain exports accounting for around 42% of world exports.

The United States runs a large oil deficit, but North America's deficit as a whole is similar to Europe's and only about half that of Asia. Whilst shale oil is not the miracle that a lot of us would like to think, it will limit any need to grow imports in the medium term and very likely will reduce imports. As it presently stands, the US manufacturing deficit has improved in recent years, not its petroleum deficit but this may just be a matter of time. The US has the world's largest reserves of coal and is building the world's largest coal to liquids plant. Shale gas is flooding the US at about 25% of the price in Europe and Asia giving its petrochemical industry a huge advantage. China's increasing reliance on coal gasification technology and low density energy in general will weigh on its competitiveness. Europe's advantage is both energy efficiency and low fossil fuel intensity of power generation. The European Union's energy intensity of GDP, based on 2009 data, is about 35% lower than the United States and 80% lower than China, whilst the fossil fuel intensity of its power generation is 28.5% lower than in the United States and 38.6% lower than in China, however if Germany turns off its nuclear power as it is threatening, it will narrow this gap.

Whilst the West still has further restructuring to go before competing head on with China for the depleting resources, government will be hard pressed to overcome the huge natural advantages the developed economies have. As China turns from a net exporter to importer, and therefore from a

supportive to subversive role, bilateral trade agreements are likely to be made that will disadvantage it. The US doubled its trade surplus in manufactured goods in 2011 with its 17 free trade partners, and is looking to form a 9 or 10 nations Pacific Rim Free Trade Agreement with Chile, Peru, Australia, New Zealand, Malaysia, Singapore, Vietnam, Brunei and possibly also Japan. It would be the biggest such agreement since the formation of NAFTA in 1994, and similar to the dollar standard it would tie these economies ever closer to the United States. It would presumably also have a similar 60% origination requirement forcing external companies wishing to sell into these markets to relocate production bases accordingly. Whilst not a tariff, it would have a similar effect, dividing Asia.

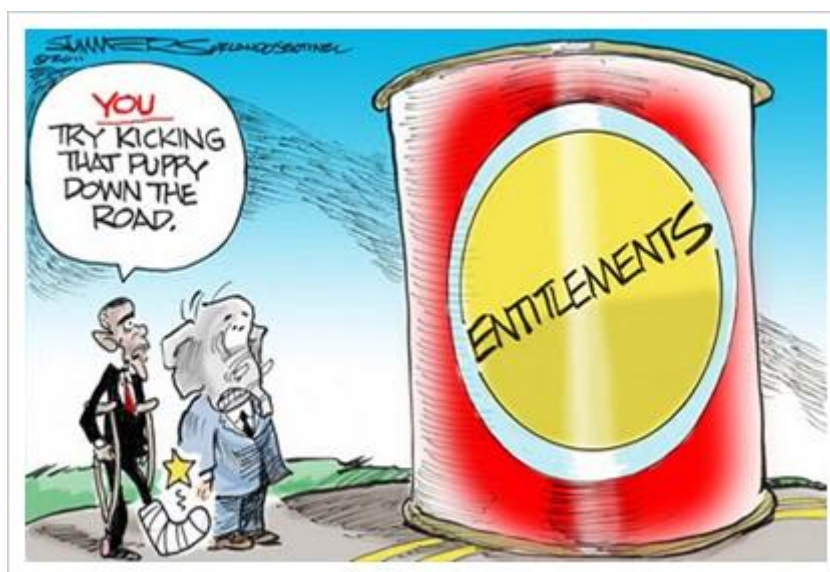
The 3rd January 2012 Wall Street Journal article *America's Play for Pacific Prosperity* suggests the agreement could be as influential on the continent as the Marshall Plan and NATO were on Europe. The premise of America's investment in the region is to build a new balance of power to counter the regional power of China. The engagement is economic in all cases and military in most. Whilst the military partnership is not on par with NATO and at this stage falls well short of containment, its purpose according to the paper is to stop China mounting a quest for regional hegemony. The US withdrawal from Iraq and its refocus towards Asia could also be interpreted as a strategic shift of emphasis from controlling oil supplies to controlling and limiting the competition for those supplies.

Analysis of Chinese growth has changed over recent years, shifting from an economy based on foreign investment and profitable exports to one based on debt, unproductive capacity, declining operating cash flow and soaring accounts receivable, which have risen nearly 50% over the last 4 years to around CNY1.2trn (USD190bn). China's off balance sheet debt has soared such that by the end of 2011 Fitch estimates total debt could reach 185% GDP. Its foreign exchange reserves will afford it quite some time but the writing does now appear to be on the wall for rapid sustainable growth, as is also the case with India. Neither country seem particularly competitive anymore, with production either being brought back home to the developed economies or shifted to lower wage and lower input cost economies. Austerity is likely to be imposed through rising NPL's or non-performing loans, however China's preference to simply modify and extend existing loans rather than recognising and shutting down unproductive capacity, means that this will materialise through accelerated monetary growth, structural inflation and declining productivity. Asia's growth relative to the developed economies is likely to initially slow and then reverse, with stage three of the competition for resources not between the East and the West but rather domestic to Asia itself as stage 2 has been domestic to Europe.



Until we get a new supply of resources, we are simply managing a decline, pricing one marginal product out after another. Balance sheets will contract leaving banks and other financial intermediaries in a continual state of underfunding and having to raise capital through a combination of new equity issuance and asset sales, but primarily through further central bank monetisation. Whilst this supports existing debt, it is a very dangerous game enabling the factors of production to continue being wasted. If governments cannot break the social feedback loop, then as the economy shrinks the misallocation of capital and the downward spiral will intensify. Historically the inability to take these hard decisions has resulted in either complete economic collapse or war, transferring power temporarily to a body that can legitimately make the tough decisions necessary to allocate capital productively and break this feedback loop.

The question is whether we can come to our senses before we run over the edge of the cliff. Unfortunately there is nothing to suggest at the moment that we can. I am not even certain whether the political or social super tanker has started to change direction as yet, and certainly the mainstream economic opinion that helped get us in this mess in the first place, is still calling for more social transfers. They have still not recognised that it is the tools and policies they have promoted over the last 40 years to avoid cleansing the system that are responsible for the crunch we are in today.



<http://teresamerica.blogspot.com/2011/03/obama-is-kicking-can-down-road-but-is.html>

In order for debt reduction to get within reach, a total change in the political and social mind-set is necessary. Society has to be realigned with a productive and innovative economy. Flexibility and change has to come from the factors of production themselves rather than their financial representation. Government and central banks must allow the symmetry of risk to return, which means acting neither as lender nor as buyer of last resort. Non performing debt and misallocated capital must be allowed to be cleared even at the expense of hurting savers and at the risk of contagion and bankruptcy. Antitrust regulations must be imposed once again to allow free and competitive markets. The hand-out and entitlement culture of demand-side policies has to be abandoned for what it is, a tax on prosperity.

The Thatcher reforms of the 1980's were done under the economic umbrella of North Sea Oil, and the political dividend of winning the Falklands War. Shale gas may give the US a similar cushion to start restructuring the economy, and grass-roots political reform from the Tea Party and even the Occupy Wall Street movement may also focus political thinking, returning some element of fiscal sanity and banking prudence to the economy, at least at the margin. Whilst the 2012 elections may start turning the economy at the margin, the depth of misallocation and social thinking is so extreme and ingrained in all aspects of society that it would take many years to clear the system to something that could be described as productive and efficient. With the most important factor of production in decline until commercial fusion is available, even if government can start to relocate the economy more productively, it will still only be a relative game in a declining world.

You can't have one country on the gold standard. It has to be accepted by all, or at least by a bloc. Europe's strength is the very fact that it is only a monetary and not fiscal union, and that transfer payments are politically far more difficult than would otherwise be the case. Greece and Italy are presently run by technocrat governments whilst others have recognised that a similar fate is in store unless they get ahead of the curve and make proactive austerity cuts. Europe as a whole runs a balanced position with the outside world, but its internal finances are in a crippling mess because the financial industry incorrectly assumed that it was a transfer union and applied similar credit ratings to different countries no matter their relative debt. With the banks now forced to recapitalise, once again

the hard decisions are being taken remotely by the market and imposed on the banks, their shareholders and creditors. The governments and central bank's seeming indecision and inability to establish any safety nets beyond the minimum, is actually the system working precisely as it should, rather than as those with vested interests would want. Europe will undoubtedly suffer a severe slowdown as it clears its debt and restructures, but this should support productivity and thereby position it relatively well going forward. There is of course the question of whether individual electorates will accept austerity imposed by technocrat governments, but with the only alternative, possibly more severe restructuring imposed by the markets directly, there is little choice.

Japan has been seen as the safe haven. Whilst its government debt problem is larger than most, it has been financed by a positive domestic savings ratio. Economists have long warned that as Japan grows old it will eventually start running down its huge savings, forcing it to finance its debt abroad at higher and less predictable interest rates, however they had assumed it had another 7 or 8 years before its savings ratio turned negative. The nuclear crisis subsequent to the 2011 tsunami may have changed that. Japan's increased reliance on fossil fuels is likely to result in its first full year trade deficit since 1963 in 2011/12, weighing on those savings and bringing forward the date when the savings ratio turns negative to perhaps 2014. Should fossil fuel prices rise; the terms of trade will move against Japan and accelerate the process. Public debt is already twice the size of the USD5trn economy and any prospect of current account going into deficit would shatter the firmly held belief in the market that government bonds are stable because of their domestic ownership. As soon as you pass that watershed, JGB yields will start to rise rapidly making the debt position "instantly unsustainable" according to IFR markets. Germany's exit from nuclear power by 2022 will have a similar effect; however the reduction in surplus savings is more likely to weigh on the recipients of those savings; southern and eastern Europe rather than Germany itself. The most likely course of events, where possible would seem to be the governments backtrack and keep the nuclear plants open, rather than forcing themselves into a position their economies cannot afford.

Chapter 10. Killing the Patient in the name of Keynes

Social democracy infers a set of values that economically have no value. Without productivity or innovation, the only way to maintain or grow output is to consume down your balance sheet; to borrow from your future or from someone else's. It is reliant on some sort of transfer payment, whether through direct transfer, the creation of non-jobs both in the public and private sector, or debt rising relative to GDP. It is a tax on the economy, and thereby on productivity, innovation and evolution. Social democracy is a consumer rather than producer of capital.

The prescription offered by the economics profession to our present slowdown is for greater stimulus; for more of the same. By distorting pricing signals and the availability of capital and resources, this policy takes the economy further and further away from the fundamental foundations of productivity and earned income. Imagine a Venn diagram of two circles overlaying each other; the economy and society. By creating artificial demand and supporting unproductive assets, social democracy is dragging the social system ever further away from the economy on which it relies; the overlap between the two, or the productive allocation of resources, has now fallen to such an extent that is debatable whether the multiplier on further stimulus would be positive at all.

Running up ever larger budget deficits under the pretence that it is the solution, or raising taxes still further on the productive part of the workforce to subsidise the unproductive side makes absolutely no sense at all; you are simply killing the Goose that lays the golden egg. There are plenty of things the governments can do; increased Federal R&D spending; increase high level university programmes, subsidise R&D projects that may drive growth going forward, tackle the anti-competitive monopoly rules etc, but it has to concentrate on boosting the economy through reforming the supply side and making it more competitive rather than burying it under ever more tax from demand side reforms.

The marginal productivity of labour has been stagnant at an extremely low level for a long time. We have not been creating useful productive jobs for people replaced by technology for years. With demand side policies killing the economy, the economics profession has to accept an element of responsibility. Unfortunately it is only a soft science, and like religion before it, it is used by our political leaders as a tool to justify policy; effectively to support social democracy as oppose to capitalism. With around half of the economics profession employed directly by the state, and the majority of the rest employed indirectly through banks, the main beneficiary of monetary expansion, it would be hard to imagine them not endorsing demand side policies in just the same way as the courtiers endorsed the emperor's new clothes in the fable of the same name. *The more rocks you take out of the pond, the more rocks are revealed.* The further you dig the more you realise that a lot of the financial infrastructure that we associate as essential to the smooth running of the economy, is in fact government tools used to support policy and re-election, prioritising the short term popularity at the expense of long term sustainability. With a more productive use of capital, there simply wouldn't be the need for such a large financial or government system.

It should be no surprise therefore that whilst innovation peaked in 1845, the uptrend, still in place until 1905, had broken down by 1915 just a year after the formation of the Federal Reserve Bank and the introduction of fiat money. The 50% collapse in innovation in the 30 years subsequent to the end of Bretton Woods Agreement and the introduction of uncollateralised currency again reflects that the financial architecture necessary for social democracy is destructive to the economy on which it relies. It is fool-hardy to suggest some sort of conspiracy amongst the leadership to control the economy; they are simply not that bright. Instead the situation has evolved through feedback loops that reinforce the downward spiral around the central philosophy of social democracy.

Maintaining economic growth in a factor constrained world is about consuming down the balance sheet; unwinding the “infrastructure” on which output had been based. The market concern is that infrastructure may include the euro, but in the world I am describing that would only be a starting point. What about the dollar standard? England maybe unshackled from Scotland if carries through its threat to devolve. A similar breakup happen of China may be necessary to stop the industrial coastal cities being dragged under by subsidising the unproductive inland provinces. Will the social stresses become too big for the political systems to survive in their present format?

According to the constitution of the International Labour Organisation, “universal and lasting peace can be established only if it is based upon social justice”. Unfortunately this founding principal is ultimately what may lead to conflict. Whilst as human beings we are generally supportive of some sort of income redistribution and economic egalitarianism, the economy itself has no such qualms, requiring instead a near optimal allocation of capital to fuel its survival and growth. Ultimately the system must break down. The cost of financing will increase to the point that social transfers and the political system behind those transfers become untenable and are unable to survive. A higher cost of capital will enforce discipline on our leaders. Hopefully this can happen through political processes, but it is worth considering that even Britain is said to have been on the verge of a military coup at the height of the economic collapse in the 1970’s that would have established Lord Mountbatten as an interim prime minister had it not been for Harold Wilson’s unexpected resignation. Culture will make a major difference. The longer the government delays and continues strangling the productive economy, the more drag it will have on the “can do” culture necessary to get us out of this mess.

The Report from Iron Mountain is a book published in 1967 during the Johnson Administration which puts itself forth as the report of a government panel of 15 men whose identities remain secret. The report was not intended to be made public. It claimed that peace was not in the interest of a stable society, and that if lasting peace “could be achieved, it would certainly not be in the best interests of society to achieve it”. I have only read summaries of the book, and am well aware that including any reference to it may undermine the credibility of everything else I have written here, but given that it is saying that war effectively serves an essential function of cleansing the economy of unproductive capacity, it should be a warning to government of the inevitable path to destruction they are treading.

The positive is that the present mess is of our own making, and that it can be reversed if we so choose. Growth is not being constrained by a technology frontier, but rather by the systematic misallocation of the factors of production that has been central to government and social philosophy. By transferring capital from productive to unproductive uses, we are altering the time preference for money and thereby borrowing directly from the future. Given that the difficulty of scientific advancement gets harder and harder, and needs more energy and more computational power and thinking to get over that hurdle, there is a limited amount of time before the present system of factor mobilisation or horizontal expansion has consumed down our balance sheet to the point that advancement is no longer possible. Whilst I think and hope that is still a long way off, the closer we get to that level, the greater the rationing of capital away from present unproductive uses will have to be. Marginal policy change will have less and less impact.

The system has to change. The issue is whether government and ultimately society can survive during the change; whether the public can unite behind a leadership that can implement tough decisions and allocate capital productively, or whether further sacrifice will be needed first, and how that sacrifice may come.

Good Luck!

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