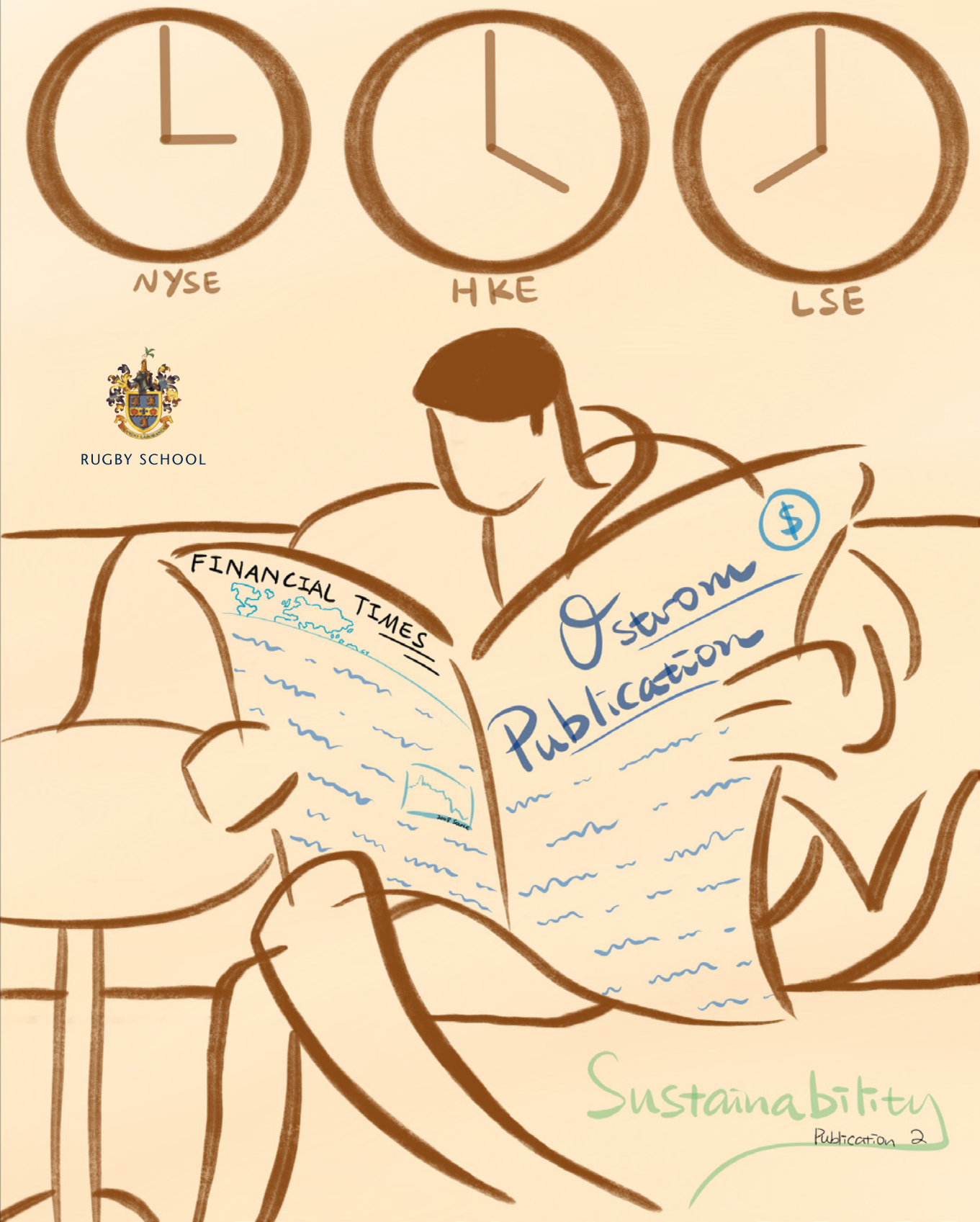
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RUGBY SCHOOL

Cover image by Catherine Ye (RB)

Editors review

WHY WE HAVE CHOSEN THE TOPIC OF SUSTAINABILITY

Sustainability refers to practices that support economic growth without negatively impacting social, environmental and cultural aspects of the community. The Ostrom society collectively chose this topic of sustainability as in the world today it is an important topic that underpins the longevity of t he world economy and how sustainability must be taken into account for every economic decision. We have also chosen this topic as recently sustainability has been in the new s with the COP 27 and the Paris agreement where world leaders came together to address sustainability goals. We think this was an appropriate topic for today s economic climate and that there was infinite possibilities in the world of economics where sustain ability is found.

The Role of AI on Future Improvement Towards Economic Sustainability

CATHERINE YE

AI, shortened for Artificial Intelligence,has gradually raised its popularity onto the topic for conversations in the recent years. It exposed itself to the public mostly through its successes in the film industry, where many discovers the 'danger'of its usage in the future. Along with the technological advancement, AI has slowly developed into helping to serve a more convenient lifestyle. Therefore, I wanted to explore how we could manipulate this technology in solving the problem which is faced by all people -economic sustainability. Economic sustainability is said to be supporting long-term economic growth without having the environment and society to compromise for the consequences caused now. AI would be one of the solutions in achieving this.

A more sustainable economy would be the first step. The word 'sustainable' in this context means, meeting the needs in the present without compromising the ability of future generation in meeting their own needs. In simpler words, a greener economy. Through the growth of AI, it possesses abilities which drives different economic industries into achieving a greener-self. There has been recent proposal about a scheme which uses AI to counteract the water crisis. New AI technology could be used to monitor and safeguard the quality of water, via collecting data on water treatment plants. This would significantly improve water utility, which can boost productivity, as water is essential for everyday living. Moreover, the water scheme meets to attained No. 3, 6 and 14 SDGs[1], supporting to develop a more sustainable future. Likewise, another AI intervention to enhance sanitation and health can lead to a more sustainable future -Clean Water AI test system. The system performs real-time analysis and distinguish contaminants without an internet link. It is a self-controlled system, which only costs $500 to construct. The simplicity and convenience which the product brings would attract adjustments to be made, consequently a healthier community, since the solution to cleaner water is generated to avoid any sickness caused from contaminated water. An academics Peter Ma, proposed a system where it uses AI to detect the shape of molecules in the water, in order to identify harmful bacterias, so it can be avoided. If the system can be constructed into water pipes, it will allow worldwide consumers to monitor the water quality flowing into their own households, in help to achieve No. 3, 6 and 11[2] SDGs.

On the other hand, AI is progressing its way into enhancing the agricultural industry. There exists an app which contains 150,000 photographs of diseased plants as database to help farmers or gardeners to identify plant diseases. The app is able to spot patterns and produce predictions, which allows owner of the plant to manage the concern. Plant disease and localpests can lead to a 40% or more declination in farmer's cassava crop, and it has significant social impact, as it feeds approximately 600 million people in Nigeria alone, hence the importance of the app in at least moderating the damage caused. The AI appcould also identify pre-stage of infected plant, recognizingthe signs of viruses, allowing problems to be detected earlier and solved with efficiency. Furthermore, this app supports to achieve No. 2[3] SDG which involves food security. It embodies the potential in achieving No. 9 and 10 SDGs[4], since it involves the ability to increase productivity of farm systems, which leads to an improvement in agricultural output, resulting the closure of the digital gap between the richer and poorer nations, allowing diffusion of innovation upon further technological solutions (involving AI) towards agriculture at a time where population is surging, while food shortage is suffered by many. Resolving the fundamental issues are essential for a sustainable economy, since human is the key to lead a future. With the help of AI, economic industries and societies could lead to a more healthier and equal future, which allows a more sustainable economy.

Many people fear that the advancement of AI would potentially lead to a loss of job, due to AI being a more competitive candidate than human, as it possesses the ability to perform tasks more efficiently, thus increasing productivity. Goldman Sachs as a well-known investment banking company, employed six hundred trader in 2000, however it claimed to decrease to two human traders by 2017, due to the advances in NAI[5] causing major job displacements. The growing development of intelligent automation[6], containing the ability to problem solve, logical reasoning and perception capabilities now, specifically tackles to replace labour by substituting as a cheaper capital for firms, causing displacement of workers whilst improving productivity. Many research results has supported this idea, indicating a threat towards human's position in the future labour market, especially the poorer ones. Since the low-skill and low-pay jobs would be easier to program and perform, implying it to be eliminated sooner by the introduction of AI. However, other studies found that this might not be the case.

Some argue that despite AI's potential in replacing certain human tasks, therefore theoretically causing a decline in labour demand. Itsactual effect on reducing the overall labour demand is dependent upon the strength of the productivity effect. The productivity effect can be counteracted by the impact caused from the depressurised labour demand – as employment and wages falls as a result of a decline in labour demand, this creates further negative externalities upon society which requires government intervention to solve. It is hard to determine whether AI would eventually increase productivity significantly, since it requires further inventions to be made, which is an uncertain variable.

Human still outperforms AI with their creativity, social intelligence, ability to react to uncertainty and critical thinking. AI is incapable in negating ambiguity, which here relies on the critical thinking abilities from a warm-blooded human. This allows future possibility in AI to complement human's work, instead of replacement. For example, Alibaba, as a Chinese multinational technology company created a chatbox which dealt with 95% of consumer inquires in 2017. This allowed human consultants to deal with more complex matter raised from the consumers, hence increasing efficiency of task. According to a survey, it found that businesses which plans to adopt AI are seeking for it to complement human capabilities, rather than substituting workers. Another research found that AI would complement future education inways that AI is able to analyzethe students' performances and study techniques, allowing the human teacher to deliver information to each individual in the best method possible.

It is also believed that AI could cause further demand expansion in the labour market. Going back to the productivity effect -due to the increase in productivity in generating more goods and services in the economy, this will boost consumer demand which ultimately will lead to an increase in labourdemand on non-automated tasks. In addition, automation could also increase capital intensity of production, resulting accumulation of capital, that raises the labour demand for jobs that contains AI complementing human labour. Moreover, the advancement inautomation can eventually increase further labour demand, as improving the technologies on existing machines would not cause any labour displacement effect, hence a rise in labour demand for non-automated tasks. In the long run, AI could perform the reinstatement effect whereby development of AI creating new high-productivity, labour-intensive tasks, which requires reinstating labour as the central input into the production process, leading to a rise in labour demand that neutralises the labour displacement effect. AI itself opens up an industry full of job opportunities that involves its own development

and deployment. For instance, algorithmic auditing; trainers -who will be responsible in training the AI system, such as reducing the error rate of language translation. Explainers -who will be analysing the output by AI systems, in order to improve accountability, such as understanding AI's chain of 'thoughts'. Sustainers -who is in charge of monitoring the work of AI systems to operate the orders demanded, such as examining a CV-screening process for bias. A growing ICT sector would also be a direct effect of the future development for AI. It will create a large multiplier effect, which said to increase five additional jobs outside high-tech companies when each additional job is initiated in a high-tech firm in the same community.

Economic growth will be an indicator that is aimed to be sustained in an economically sustainable world. As previously analysed, AI possesses the potential ability to increase productivity of the economy, hence economic growth. However, AI affects many other aspects of the economy whichultimately all leads to economic growth. AI is fostering many investment innovations and entrepreneurship in the economy which boosts aggregate demand[7] in the economy. The recent growing invention of driverless cars innovating the transport sector market is estimated to expand to $3.5 billion by 2023, implying growth in the economy. Regardless of rising investment boosting aggregate demand, these innovations towards a new market could potentially create more job opportunities into the market, incrementing employment, thus enlarging the quantity of labour, which results an elevation on long run aggregate supply, hinting the productive potential in the economy to rise. Enlarging the size of the economy will allow more leeway for the economy to keep growing, since full employment will never be reached, as the full capacity of the economy is increasing. A research suggests future advancement in AI could add approximately $13 trillion to the global economic output by 2030. Additionally, another study conveys that AI could deliver an additional $15.7 trillion into the global economic output by 2030, which is similar to the data obtained from the previous mentioned research. Despite the variation in numbers (this could be caused from different calculation methods used), they both indicates a potential growth of the economy due to the advancement of AI.

On the other hand, the result from a research displays the idea that economic growth obeys a S-curve pattern (like the economic cycle), with a slower rate of increase at the start, under the condition in need to invest, develop, deploy, learn and familiarise with the new technology invented; followed by an acceleration to the peak which is driven by the competitiveness due to the improvements on complementary technology. It will then experience a period of downturn where the technology invented is allocated amongst producers, thus the market becomes less competitive which leads to the returns earned by early adopters to decrease. Hence, economic growth might not be sustained.

In conclusion, this essay outlines three approaches in which AI could support towards improving future economic suitability. Firstly, by creating a healthier economy through AI which will allow a more sustainable economy, since a healthier labour force and greener environment would produce a more powerful foundation for future development and growth. Secondly, consistent extension of the economy with the use of the abundant labour market via AI advancement, allowing greater capacity to be reached, giving potential sustainable growth. Last but not least, sustained economic growth derived from the persistent improvements made towards AI, will help to achieve economic sustainability, as economic growth is the main contributor towards economic sustainability.

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1 SDG -Sustainable Development Goals proposed by the UN
No. 3 SDG -Good Health and Well-Being
No. 6 SDG -Clean Water and Sanitation
No. 14 SDG -Life Below Water

2 No. 11 SDG -Sustainable Cities and Communities

3 No. 2 SDG -Zero Hunger

4 No. 9 SDG -Industry, Innovation and Infrastructure
No. 10 SDG -Reduced Inequalities 5NAI -Narrow Artificial Intelligence, it is a subset of AGI (Artificial General Intelligence) that is considered as a weaker form of AI

5 NAI Narrow Artificial Intelligence, it is a subset of AGI (Artificial General Intelligence) that is considered as a weaker form o f AI

6 Intelligent Automation -a combination of artificial intelligence and robotic process automation, to streamline and scale decision-making across organisations

7 Investment is a component of aggregate demand

Infinite demands, Finite resources: How is the problem of scarcity unsustainable for the global economy

ROBERT GAFFAN

Scarcity is the idea that there are infinite demands for goods and services, but there are finite resources with stores of resources depleting every second. So how can growth be sustainable, with non-renewable resources being wasted constantly, combined with a growing population representing the infinite demand of goods and services which will be demanded by the population.In November 2017, the Union of Concerned Scientists issued a dire 'second warning' about "the existential threat of runaway consumption of limited resources," signed by 15,000 scientists from 184 countries, including many Nobel laureates. This shows that we are in an ongoing time bomb as consumption of resources is unsustainable and wont be able to last.

Infinite wants

As population increases overall demand for goods and services increase which shifts the AD curve to the right, it also is affecting the quantity of the factors of production and therefore would shift LRAS, the productive potential, to the right as shown in the diagram from LRAS1 to LRAS2. Both of these shifts show that economic growth or real output has increased from y1 to y3. Therefore, population growth is directly correlated with economic growth. Theoretically therefore, the increase in population only seems positive. However, in reality it can be argued that population growth will be unsustainable and problematic as people inevitably consume more finite resources so actually do the opposite and reduce long-run growth decreasing the quantity of the factors of production as capital would be depleted. So in the short term, long run aggregate supply shifts right as the worlds population increases, so therefore will the productive potential and therefore growth. However the ongoing time bomb of limited supply shows that the population growth if continued, in the long run will result in unsustainable growth and lead to resources running out.

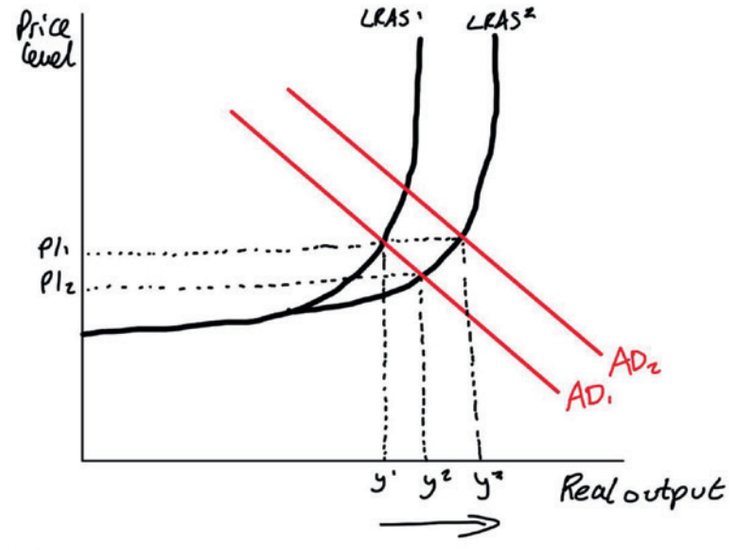


Fig.1

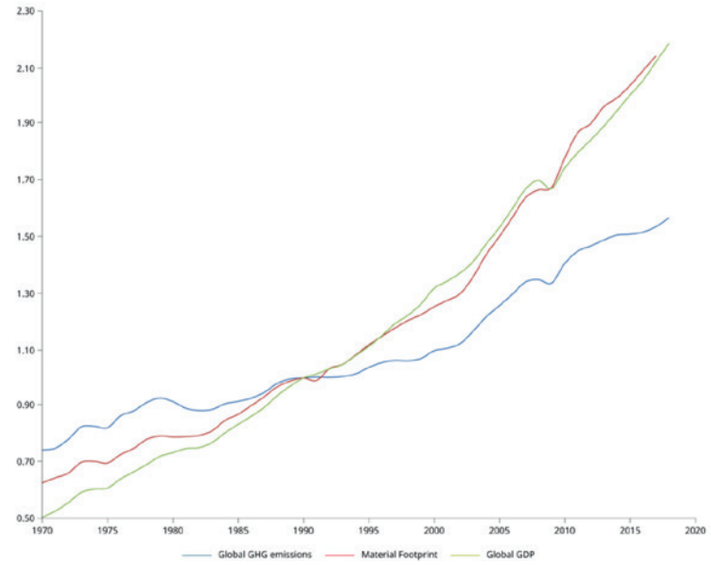


Fig.2 (Y axis: Relative change in environmental indicators and relative change in GDP)

Infinite wants from the population leads to economic growth. For output to increase stress on fossil fuels to manufacture more goods and less spare capacity in an economy leading to more non-renewable energy resources being used as these sources are more effective e.g coal and oil. Therefore as shown in figure 2 global emissions of greenhouse gasses is directly correlated with global GDP rising, GDP has risen from 0.5 in 1970 to 2.2 in 2018, where Global greenhouse emissions has a positive correlation from 0.75 in 1970 to 1.5 in 2018, showing that growth causes the world to emit more fossil fuels leading to the enhanced greenhouse effect causing climate change to exacerbate. This growth therefore, without correct solutions is not sustainable in the long-run as global warming may increase sea levels leading to more agriculture being destroyed by floods, decreasing the long run aggregate supply. It also is harmful to the environment may lead to more respiratory diseases in built up areas where manufacturing may take place also.

Finite resources

There are many factors which deplete the stores of non-renewable resources, other than simply consuming more of them due to growing population, for example reserves of oil have depleted there are also scarce resources affected by natural disasters and climate change.

One problem of exacerbating scare resources is due to climate change as seen specifically in India. One way the problem of scarcity is ever growing is the idea of climate change affecting the factors of production. In this case, Land. The UN estimates 6 million hectares (14.8 million acres) of new farmland is needed globally every year to keep up with food demand; instead, we are losing 12 hectares a year through soil degradation. In India alone, 25% (82 million hectares) of total land (329) is undergoing desertification while 32% is facing degradation. India is under a lot of pressure as India's average annual temperature increased at a rate of 0.62 °C per 100 years between 1901 and 2020,. And maximum temperatures have climbed even more quickly, at a rate of 0.99 °C every 100 years. Climate change is posing a serious issue in india, with 7% of the population living there, depleting food resources could lead to serious health risks. Desertification and degradation of soil can decrease the quantity of the factors of production so will shift a PPF curve left as shown in figure 3, if india was working at y not near PPF 1 the full potential with lots of spare capacity this would be sustainable as increasing supply would be very easy as there is plenty of spare capacity to increase production however, when the PPF curve shifted left they would be working close to full capacity with little space capacity which could be very unsustainable. This is because there may be abuses of the factors of production, for example long hours for workers to increase productivity, using idle land, which means that it may not have all the correct and efficient nutrients left and lead

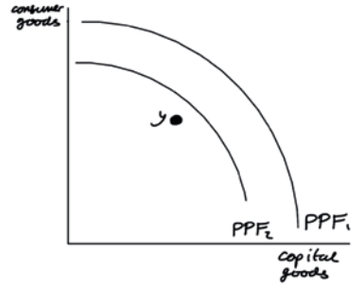


Fig.3

to unsaturation of soil. This is unsustainable and wouldn't last in the long-term.

Conclusion

Looking at india for an example, it has the second largest population of any country and is growing at an outstanding rate. Indias general decrease in supply and rapid increase in population, and therefore increase in demand for goods and services is becoming a time bomb in india where this unsustainable growth could implode on the Indian economy. It begs the question, how can you meet the demands of an ever growing population with limited scarce resources, and furthermore how this can be sustainable. This seemingly impossible question could have a very simple answer, We can't. Even if we use only renewable energy sources for manufacturing which seems like an impossible feat, ever growing population represents a time bomb for the economy by at some point where this clock will run out. In a world where climate change and growing consumer demand is depleting resources and causing millions of tonnes of waste every day, it seems as if the economy's clock has a foreseeable end. This nihilistic view of course is premature, where perhaps we should believe with integration of new technology a solution or solutions will come to light and will give a answer for for the struggle of the world economy.

Made In China: How Sustainable is China's modern cheap labour market?

RUPERT SNEATH

Since the 1980s, China has been the manufacturing behemoth of our world. The majority of products we use today are emblazoned with a 'Made in China' label, and the country's economy has flourished as a result. The primary reason for this was cheap labour, which gave China a huge comparative advantage for production. However, the country has up to now been reliant on cheap labour to grow and will need to adapt to accommodate its newfound middle class. By 'outsourcing' cheap labour to neighbouring countries and countries in Africa, all the while implementing their new global 'Belt and Road' development initiative, China must reform before it reaches economic downfall.

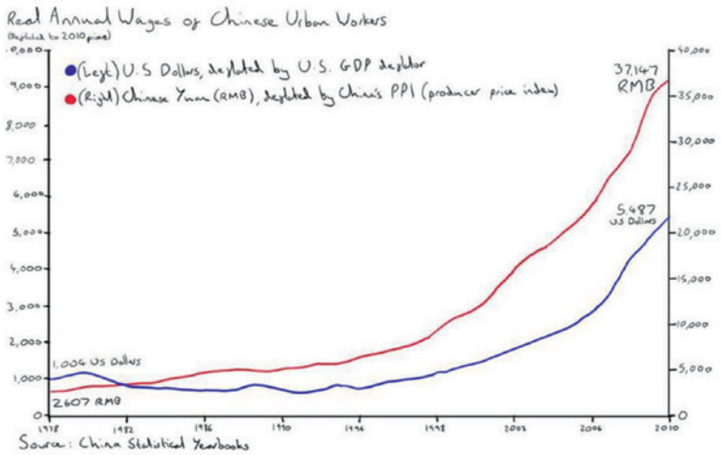
In 1994 the average annual Chinese manufacturing wage was $694, only 17% of the $3977 a worker would earn in the Philippines, and 25% of the wage in Thailand (Li, Li, Wu, and Xiong 2012). These countries are culturally and geographically similar and is where the competition for cheap labour has been since the 1980s. Productivity of workers was also comparatively high for the wages provided, creating an even bigger incentive to manufacture in the country. Many companies, such as Nike or Apple, moved their plants to China to take advantage of these low wages, and the Chinese economy grew rapidly. As the country's wealth increased, so did workers' pay; and wages skyrocketed. The 2008 annual manufacturing wage in China overtook that of nearby countries India, Thailand, and Indonesia, and reached 82% of the wage in the Philippines. Cheap labour made China the perfect candidate for manufacturing companies, but as China shifts to a middle-income economy, this advantage fades. The labour cost in China today is around 70% of that in smaller eurozone economies such as Portugal (Johnson 2017), meaning the incentive to manufacture in the country is the lowest it has been since the Great Famine of 1959-1961.

Another threat to China's breakneck growth is its rapidly aging population. China jumped from 552 million people in 1950 to 963 million by 1978. However, the 'One-Child Policy' enacted in 1979 slashed fertility rates, which fell from 6 births per woman in 1970 to only 1.6 in 2000. Today it has barely improved to 1.7, but the fact remains that China's population will age at an unprecedented rate. The population fell for the first time in 2022, with 850,000 less people than the previous year (Yeung 2023), heralding a demographic crisis. China's one child policy, while removed in 2015, caused a change in culture whereby more women chose to follow their careers than start a family. For decades, China's economy has relied on its cheap labour and expanding work force to grow as fast as it does, however this golden era of productivity may be coming to an end, and China's growth may diminish with it.

One reason China's economy is at risk is the speed of this demographic transition China has experienced. Population growth has plummeted to less than 1% increase every year since 1999, which is comparable to the 200 years (1750-1955) it took the United Kingdom to complete the same level of demographic transition, and the 140 years (1800-1940) for the USA (Greenwood and Seshadri 2002). China achieved this transition in less than 40 years, and its population has begun to decrease. The labour force in China grew rapidly initially but has now entered a period of slowed increase. A large working force is beneficial for any country, but paired with

a low fertility rate, ramifications fester further down the line. The stagnant labour growth could be in part behind the fast wage growth of the last decade, as labour begins to decrease in abundance. By 2050, the working population is projected to drop from just under a billion today to 696 million (United Nations 2011). At this point, 29% of the population will be elderly and unable to work. The dropping proportion of the labour force will cause shortages, and push wages up even further.

A major industry in which China is losing dominance is textiles, where jobs are moving to Bangladesh, Vietnam, and Cambodia because wages are now lower. News about awful working conditions in China also incentivises big companies to move elsewhere, for example Nike has moved most of its manufacturing to Bangladesh. Cheaper, labour-intensive goods that can tolerate unreliable transportation systems and electric grids such as clothes and simple electronics are swiftly moving out of China (The Economist 2010). This phenomenon is common historically – economies built on low-wage, cheap manufacturing shift to a higher skilled and higher paid work force, moving from an emerging market to a developed nation. South Korea used to export mainly textiles, but as wages rose, they began manufacturing electronics. The country's wealth grew immense quickly. China is an aberration from this trend, as it is home to over 1.4 billion people, hundreds of millions of whom remain poor and living in rural areas. It is arguable that China has reached its Lewis turning point, having depleted its surplus labour and ending the period of cheap labour it had enjoyed for so long.



Over the past 40 years, the Chinese economic boom saw 800 million people lifted from poverty, defined as people with incomes below $1.90 a day. China has contributed to nearly 75% of the global reduction of extreme poverty (World Bank 2022). While this is brilliant for the quality of life in China, it comes with the need for future structural shifts. The Chinese government will need to move hundreds of millions of jobs from factories to consumption and high value services to meet domestic demand. Education in China, while having improved, must also be equilibrated between rural and urban areas, to provide migrant workers the skills that new jobs require. The vast majority of companies are reducing production in China and increasing it in Bangladesh, Vietnam, or Cambodia. To ensure China continues to grow, it will need a workforce that can compete with other middle-income economies for jobs.

In recent decades, the migration of rural workers helped to keep wages low in urban areas, allowing Chinese factories to stay attractive for firms. However, there are major barriers to increasing this migration from rural areas. The hukou (household registration) system was established in the early 1950s to consolidate socialist governance and control domestic migration from rural to urban areas. Every person is required to be registered at their place of birth, and it disallowed many to migrate to urban areas. Since the 1990s the system has been relaxed, but rural citizens cannot change their hukou status and thus cannot enjoy public services in cities such as medical insurance or pensions; public services that are few and far between in their rural homelands. The system engendered urban residents to not want rural citizens to have access to their welfare benefits, despite the fact migrant workers are required to work jobs that locals don't want. In fact, 95% of local residents in Beijing and Shanghai opposed a proposal that would allow migrant children to take college entrance exams (NetEase 2012). To ensure a bright economic future, China must close the gap between rural and urban areas by improving education and allowing freer migration, thus providing better jobs to those who need them.

Another way China is continuing to manufacture goods is to outsource it elsewhere, namely Africa. 5% of China's export investments in the clothing industry could translate into $5.4 billion in additional exports in the African continent (Gelb 2017). Ethiopia is taking advantage of this shift, and has been developing industrial parks, creating tens of thousands of jobs. In the West our products are made in China, while in China now they are often produced in Africa. Labour costs, however, are not as low in East and Southern Africa as they are in South Asian and Southeast Asian countries (Ethiopia is an exception to this), meaning they still have an advantage over China and its investments on the African continent. China is also estimated to invest $575 billion into its new 'Belt and Road' initiative (BRI), to massively stimulate trade with China throughout Eurasia and Africa. This is done by closing gaps in policy and infrastructure between countries to decrease trade costs. In many ways, the BRI will help transition China's economy from low-wage to high-wage smoothly while ensuring a continuation in economic growth. If it has very strong trade routes it will remain a centre for imports/exports because it will be cheaper to get products in and out of the country.

China has proved to be a miracle of a country, converting from a backwards agrarian economy to the manufacture powerhouse it is today in an incredibly short time. Even with the largest population on earth – until India overtakes it in the coming years – China's success has lifted hundreds of millions of people out of extreme poverty and is ready to become a middle to high income nation alike neighbours Japan and South Korea. However, China is on a precipice for economic growth, faced by huge labour shortages, rising wages, and a demographic catastrophe; the country must continue to reform massively if it wants to maintain its rapid success on the world stage. Global initiatives like the BRI may be China's solution, moving the manufacturing it needs outside of its borders allowing it to focus on higher skilled and higher paid jobs for its own citizens, as well as slowly facilitating easier migration for workers from rural areas to access the public services that only big cities can provide, such as education. In South Korea during the 1980s, the majority of jobs were in textiles. Once wages rose and surplus labour was depleted, the economy moved to accommodate electronics and computing, which were better suited for countries with good education and higher wages. China appears to be going in the same direction, but with 1.4 billion people to accommodate for (many of whom are still poor agricultural workers), this task in China will be a significantly more difficult one to achieve. South Korea is small, and therefore it is difficult for different areas to vary significantly in prosperity. China, on the other hand, is massive, and will seek to rectify its slowing economy by moving hundreds of millions of jobs out of manufacture before the population ages to the extent that a large proportion of the work force have to look after the elderly. If it can do this, China will be the economic hegemony by next decade.

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A discovery into Modern Monetary Theory: how sustainable is running a government budget deficit, really?

EDGAR COATES

The 15th of March will see the Chancellor Exchequer (Jeremy Hunt) release 'The Budget'. In it, Hunt will plan the next year's government spending and tax proposals in line with economic forecasts and constrained by the current government budget deficit. It is predicted that Hunt will aim for austerity in hopes of targeting inflation and stabilising the economy, in response to Liz Truss' chaotic premiership last year.

It is safe to say that Hunt's (potential) approach is not backed by Modern Monetary Theory (MMT). Hunt's austerity draws from the fear of the effects of a high government budget deficit on inflation and stability. It is fiscal prudence and financial orthodoxy in a nutshell. Modern Monetary Theorists aim to amend Hunt's fears.

Modern Monetary Theory fundamentally argues that a government budget deficit is no cause for concern for a nation that issues its own currency. There are three basic pillars on which, MMT-ists state, this assumption stands. The first pillar is that a government that issues its own currency can never go broke. Think of the banker in Monopoly. A government that issues a currency that is not backed by a commodity (e.g a gold standard) can always simply issue more of that currency to pay for assets. As an extension to this, a government with such a currency can never default on debt nominated in its own currency, as again, one can simply issue more currency to repay the debt. So, to feed back to the question, an MMT-ist sees a government budget as sustainable as there is no threat of debt obligations, seeing as the government can simply issue credit, or even simply print money to pay for it.

Explanations of this theory start with the idea that the government has monopoly power over currency issuance. If the state is the sole legal supplier of a sovereign currency, the state can issue as much as they like. This is derived from the view that money is now solely a creature of law, not something which has a value attached to something tangible.

In the past, money was a medium of exchange whereby if you held the money, you had the right to something of value which could be traded for it (e.g gold). Even up to 1971, this was the case for the US dollar under the Bretton Woods System, when one US dollar was guaranteed to be convertible to one thirty-fifth of a troy ounce of fine gold. In 1971, this was abandoned. MMT posits that the value of money, now, is held in that it is the payment, which is accepted by a government for taxes, and is the payment recognized by courts of law as sufficient for any monetary debt. It is the ongoing tax obligation in the currency, assuming constant confidence and acceptance of such, which underpins the value of the currency. In this way, as the government determines the value of the money, it has the power to issue it at will.

MMT holds this fact as crucial to how an MMT-economy would function. Taking the government as having a monopoly in currency issuance, it is a well-established economic fact that monopolists are price setters. As they determine the supply of a good, they similarly get to determine its value. The value of the currency is what one must do, or one must offer, to obtain a set amount of that currency. MMT places the government at the centre, essentially, setting all price levels in an economy. Key MMT figures extract from this the theory that government spending is thus a key factor in inflation, but not due to its effects on money supply as Friedman posits, but it is when the government pays more for a good of the same value. Therefore, assuming the rationality of those in the government, running a high budget deficit may be sustainable as the price level is not determined by the quantity and velocity of money in the economy, but instead by what the government sets it to be.

The second pillar of MMT argues why a deficit may even be necessary, in a moral sense. Since we have now reframed the danger of a government budget deficit, the government has essentially been granted immense new spending power. MMT argues that this is not an excuse to spend without purpose, however, and instead government spending should target explicit goals in an economy. For too long, they argue, the goals of politicians and economists have been abstracting from the real social welfare of the people in an economy – targeting abstract numbers like the budget balance, tax revenue, and trade deficits. MMT aims to change that, shifting to spending with the sole goal of maximising human welfare. The most cited examples are achieving full employment (through a national job guarantee) and nationalised education and healthcare as they, as you may agree, are perceived as enhancing the prosperity of society. In essence, the government should spend whatever is required to achieve the goals set out by the government which are deemed most necessary for human welfare. Projects such as a government job guarantee, MMT argues, see that a nation has maximised its use of human capital and may also act as an automatic stabiliser. This idea of an automatic stabilizer is crucial in MMT as it mediates inflation and flows with the torrential movement that occurs in private markets. The reasoning goes as follows. If unemployment rises due to low demand, a job guarantee supports demand and human capital is put to use in public projects. The government's involvement expands. As the economy then returns to health, the private sector hires again, demand increases, and the capital is put to work in private projects. Government's involvement contracts again. It is projects like these that are fundamental pillars of what makes MMT, and what MMT-ists believe makes it sustainable in economics and morality of approach.

The third pillar of MMT is how inflation should be mediated in an economy where government spending is plentiful. In MMT, inflation is seen as a result of excess demand in an economy, as opposed to the common view that inflation is a result of too much money in circulation. To combat this, MMT proposes using 'higher taxes' to restrict this demand. Other strategies such as increases in tightening regulation on the financial, environmental, and defence related systems (to shrink them) and government bond sales. These strategies, in a Modern Monetary Theorist's eyes, are not to fund public sector spending, but to mediate the inflation effects that the spending on human welfare has on the economy. Assuming apt use of taxation, regulation, and bond sales in a targeted and timely manner dependent on the specific economic conditions, MMT can target the main threat of government spending, inflation, to keep the policy sustainable for many generations.

Nevertheless, it is a common conclusion that Modern Monetary Theory is unimplementable, dangerous, and, as Larry Summers states, "voodoo economics". It is unimplementable in its restriction of individual freedom and the heavy reliance on irrational individuals in the government. Economists have long held that macroeconomic policy should aim to guide the more powerful and effective forces of market resource allocation. This is opposed to how MMT shifts the majority of economic power to the government. Taking the power from the private sector restricts the rights to personal freedom and choice which most capitalist economies pride themselves on.

Also, the injection of spending into public resources assumes private industry would not amend the same perceived issues anyway. From that, you get the crowding out effect, where rising public sector spending needlessly drives out private sector spending. In addition, society also becomes prey to the mistakes of the selected few in government. Even the brightest of governmental officials are prone to the same psychological irrationalities as the layperson. So, to teeter on the edge of hyperinflation through overspending at maximum productive capacity, with only irrational beings preventing us from falling; to me, seems reckless at best. This is compounded by the fact that governments are

liable to influence from political pressure groups and their want for re-election, so governments may be especially inclined to not act as the rational governments MMT necessitates. To nimbly tinker with tax changes (changes which are notoriously difficult as is) to keep excess demand at bay, without regarding the effect it may have on public opinion would take a politician inhuman in their skill and rationality.

Finally, Liz Truss will tell you how long unwarranted government spending keeps you in office.

Regardless of the sanctity of her's and Kwasi Kwarteng's economic models and theory, it is trust and confidence in such economics which holds economies together. MMT fails to consider this fact. I see that a similar fate to Truss' lies in wait if MMT were to be implemented: bond yields spiral, pensions evaporate, one's currency devalues, etc. A recession and financial crisis would be quickly on any nation's hands that wish to implement Modern Monetary Theory.

It is my conclusion that the full application of Modern Monetary Theory in government is simply utopian yet is a useful lens through which we can re-evaluate the common inefficiencies of usual government practice. I see it to be a noble cause to demystify the budget deficit, as it is a number often cited by politicians which so slyly detracts the focus from real social welfare. Nevertheless, the fine line to hyperinflation, and the issue of implementation mean it is unsustainable in the real world, despite it being sustainable in theory. Thus, it is nothing more than such – a useful allegory.

Economics of sustainability

JACK WANG, JACK PROCTOR, LEO ROBINSON

Sustainability has become a critical issue in today's business landscape. With growing environmental and social challenges, companies are increasingly looking for ways to integrate sustainable practices into their operations. However, achieving sustainability requires more than just individual effort. Collaboration and innovation are key to driving sustainable change on a large scale.

Sustainability is a concept that refers to meeting the needs of the present without compromising the ability of future generations to meet their own needs. It involves balancing economic, environmental, and social factors to ensure long-term prosperity. Sustainability is not just a moral imperative but also a business necessity. Companies that prioritize sustainability are more likely to succeed in the long run and gain a competitive advantage.

The economics of sustainability is the study of the economic implications of sustainable practices. Businesses that adopt sustainable practices can benefit from reduced costs, increased efficiency, and improved reputation. Sustainable practices can also create new opportunities for innovation and growth.However, implementing sustainable practices can be challenging. Businesses may face regulatory hurdles, supply chain issues, or resistance from stakeholders.

Collaboration is essential to achieving sustainability on a large scale. Companies can partner with NGOs, government agencies, and other businesses to accelerate progress towards sustainability. Collaboration can help share knowledge, resources, and best practices to achieve common goals.

Collaboration can also help address sustainability challenges that individual companies may not be able to tackle alone. For example, global initiatives such as the United Nations Sustainable Development Goals require collaboration between businesses, governments, and civil society to achieve lasting impact.

Innovation is another important factor in achieving sustainability. Businesses can drive sustainability by exploring new technologies, business models, and approaches to sustainability. Sustainable innovation can create new opportunities for growth and help companies stay competitive in a rapidly changing marketplace. Innovation can also help overcome sustainability challenges. For example, renewable energy technologies are becoming more affordable and efficient, making it easier for businesses to transition to clean energy sources. Circular business models, which prioritize reducing waste and maximizing resource use, can create new revenue streams and reduce environmental impact.

In conclusion, sustainability is not only good for the environment and society, but also for the economy. By implementing sustainable practices, businesses can reduce costs, increase efficiency, and create new revenue streams. For example, energy-efficient buildings can save money on utility bills, while circular business models can reduce waste and create new products and services. Moreover, businesses that prioritize sustainability are better positioned to meet the demands of consumers and investors who increasingly expect companies to act responsibly. As more

companies embrace sustainability, a new green economy is emerging, creating new jobs and driving economic growth. While implementing sustainable practices can be challenging, the long-term economic benefits make it a worthwhile investment. By collaborating with others and embracing innovation, businesses can accelerate progress towards a sustainable future that benefits not only the environment and society, but also the economy.

Saving tomorrow by changing today: an outlook on a sustainable NHS system

KALMAN YANG

All of us are living. We all have a heart which beats blood around our body, lungs which take in the air we breathe and a brain which allows to think and make cognitive judgements. In economics, there is a focus on trade, the labour market, maximising profit, predicting people's behaviour and more. It is not very often that we take a step back and remember that we are living organisms who live and die when we are wrapped in a world where work, school and sports take priority over our health at ;mes. As humans, we have two goals: survive and reproduce. Taking this into account, it does not make sense how the NHS is currently in a crisis: the one place we go to when we are infected, injured or need to seek help can no longer do this. With the number of doctors per capita shrinking, funding for the NHS not drastically increasing and an ageing population emerging, it is difficult to say that the NHS will come to a halt in the next few decades. When discussing the topic of sustainability, what good is it talking about carbon-zero when we cannot ensure that we won't be able to live long enough to see its impacts?

Sustainability

The word sustainable gets used a lot especially when talking about the environment. According to the OED, sustainability is defined as "capable of being endured of borne". In simple words, ensuring what we have today won't go away tomorrow. One of the more prevalent topics in the news is environmental sustainability; activists seek to try and reduce the damage we are doing to our environment by changing how we approach different tasks in industry, business, and our daily lives. Another important stance on sustainability is taken from the United Nations. The UN set out 17 goals in 2015 to "end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity" by 2030. Some of these goals do pertain to the environment for example, goal 13 is "Climate Change", goal 14 is "Life below water" and goal 15 is "Life on Land". All of these goals do pertain to the environment and ecology ensure that our planet does not go past the point of irreparability; however, more importantly the UN focuses on other aspects of sustainability such as poverty, equality, and health. Goal 3 is "Good health and well-being" which directly refers to healthcare systems; being third on the list elucidates its priority towards the UN hence it should be a priority for governments to tackle especially in a ;me of crisis. The Royal College of Physicians (RCP) the values needed to achieve quality healthcare: this includes population health and wellbeing, individual care, and sustainability. It is important to take into note sustainability's place in these values. The RCP then continues to explain that sustainability involves environmental, social and financial aspects towards healthcare as well as "improving the quality of care for patents today without compromising health and care provision in the future". The application of sustainability is more than relevant it is necessary especially when considering the current stress of the NHS system.

The NHS

The NHS was founded in 1948 under the management of Aneurin Bevan. The NHS was based on three core values: the ability to help everyone, the provision of service which came at no cost and that care would be based on need rather than wealth status. Exactly

75 years later, these core principles have not changed. Currently, the NHS is financed from state tax which is redistributed into the industry. Financial support first starts in the treasury where money is collected from sources of tax and national insurance. The treasure then sets a budget for each government department. The budget the gets split once again into capital for buildings and equipment, day to day spending, public health, staff training and other sections of healthcare. In 2021/22, the RDEL (day to day budget) was £157.9 billion which equates to just about 12% of the GDP; In 2018/1 the RDEL was £130.2 billion. With a growing population and increasing drug and treatment prices this makes sense, however, is this maintaining a status quo or improving the current NHS situation.

Workforce and Politics

In terms of staffing, the NHS suffers from chronic workforce shortages. Even from its inception the NHS was suffering from this issue "the situation is extremely serious already [and] it is likely to soon become critical unless thousands of new recruits can be obtained quickly" stated Bevan. Staffing has always been an issue in the NHS, and it seems to be a problem which cannot be solved. In September 2022, the vacancy rate among doctors was more than 7% and this rate was 12% for nurses. This shortage also does not only apply to medicine, but the House of Commons Health and Social Care Select Committee has also highlighted the shortages in almost every other healthcare profession.

What effect does a workforce shortage create? To put it simply, the quality and quantity of care are not up to acceptable standards. Currently there is a waiting list of almost 7 million people in NHS England. As a healthcare system whose primary goal is to treat all patients, having a waitlist of 7 million people is very contradictory. An analogy to this situation is if a designer has an idea for a new Porsche and draws it out however doesn't have enough material to make the entire car: you'll get a working car which drives but there aren't any leather seats anymore; the infotainment system also doesn't work; you only get one paint colour, black; the engine isn't a powerful V8, instead it is a weak and feeble L4 engine found in mini coppers. The idea is fine however, there isn't enough resources to be able to produce a working system; the idea underperforms or falls apart.

However, a more striking issue is the impact on the staff who work in the NHS. Healthcare is a demanding profession with doctors need to train for 6 year in university followed by 2 years of a foundation course to become a junior doctor. There then proceeds another few years specialising; you can go either into surgery, general practice or any one of the several specialties in medicine. It take about 10-15 years after graduating secondary school to be able to become a fully-fledged 'doctor' where your salary is £88,364 a year. In FY1 (the first paid year after coming out from university), a junior doctor is paid £29,384 which is below the national average of £33,000. To put this into perspective, a qualified medical student who has dedicated 6 years of their lives still underperform comparison to the rest of the country. As a junior doctor works more than 40 hours a week; not only do they need to work in hospitals but still need to study and revise. In a week the NHS prescribes 28 hours of clinical activity and 12 hours of educational activity: so even when you think you are done with studying for the rest of your life, it doesn't stop. There is also around 6 leave weeks which would lead to at a minimum of 1840 hours of work a year. With all of this taken into consideration a junior doctor at the ripe at of 24 earns around £15 pounds an hour. For context, minimum wage is £9.50: this is a lille bit concerning especially when considering the numbers of doctors who leave the industry. Long hours and low pay contribute to poor mental health which means that doctors are no longer able to perform at their peak. The quality of healthcare is no longer good anymore. This not only lead to a worse delivery of healthcare, but it also leads to increase sickness absence which makes the problem far worse.

In most industries, a shortage in the work force means that supply of a company will decrease hence the employer must negotiate with employees to be able to meet their needs. Unfortunately, in healthcare there is only one employer, the government: this offsets the employee advantage during labour market fluctuations. Rather than pay rises being reflective of local labour market conditions, it is the result of pragmatic national compromises which lead to the agreement of employment contracts. The inflexibility of conditions therefore lead to the large secondary labour market where there is a high turnover with lille pay; this leads to instability and unpredictability in continuity of care. This is also far more expensive than more permanent option because of the costs which need to be spent of staff and agencies. These shortages then create strain on the NHS which lead to questions about its sustainability.

Sustainability and Transformation Plans

The NHS is very aware of this situation and in December 2015, planning guidance was produced by the national NHS bodies to ask NHS organisations to work together to be able to make plans for the future of health and care services in their area. These plans are called the Sustainability and Transformation Plans (STPs). These plans covered all areas of the NHS up until 2021. The main goal of the STPs was to improve the delivery of healthcare by making healthcare more efficient. It is clear that the government won't make a clear change in their stance will the NHS budget. Instead, the NHS decided to attempt to do more with what they have. NHS organisation focused on three main areas of health: population health and wellbeing; quality of services; and healthcare efficiency. The plans are focused on 44 areas in England with a combined average population of 1.2 million. The STPs is a maker of resource management and optimisation.

Some of the key areas that the STP targets which include redesigning primary care and community services; changing the role of acute and community hospitals; strengthening prevention and early intervention; improving care in priority service areas such as mental health; improving productivity and tackling variations in care; supporting and developing the workforce; improving IT, estates, and other enables; and organisational changes to support STPs. These key targets main attempt at bringing NHS organisation together to work as one rather than many independent firms. This would save money on resources for each organisation and lead to an integrated care system (ICS). Public health is a key focus for the STP because if done right, preaching for a better daily routine will massively decrease the cost of the system. The number of patients with lifestyle induced conditions will decrease leading to more money being able to be distributed to patient who need costly treatments. It is important that we bring patients into healthcare, so they are not consumers of the healthcare system but instead partners with the healthcare system. This therefore put people in responsibility for their own health and with the help of the NHS the population can better learn how to manage their own health.

Other plans such as the NHS long term plan also places an emphasis on the need to create patient centred care. Linking more to the environment goals of sustainability these plans also focus on green prescribing; this is where cheaper and effective treatments are given to patients. The treatments are alternative forms of intervention which are less medical instead of routinely providing drugs and other carbon intensive therapies.

AI

There are many things which might be able to help with improving efficiency in the NHS. One of the most exciting things is AI. The phrase ';me is money' is very true. The applications of AI are endless. Currently the uses of AI include helping students write last minute essays however, the scope of AI is far greater than ChatGPT. In healthcare there are already many interesting sectors of AI. When most people think of AI in healthcare, its use in radiology is talked about a lot. AI systems are able to detect tumours or any abnormalities in certain areas of the body using MRI scans. They are able to do this as well to a very high degree and are also able to outperform physicians even sometimes. In an age where the NHS is attempting to improve its efficiency, using AI to save ;me on diagnosing patients allows money to be spent on other areas. AI is able to help with the optimisation of situations. Through more training and the use of neural networks and machine learning information such as hospital bed optimisation to treatment options are able to be synthesised using these models. Which once again save ;me but also improves the decision making of physicians.

Conclusion

It is clear to say that the NHS is currently not very sustainable. It is limited by the English government to make any real impactful changes. The short-term fix is to improve the efficiency of the NHS by spreading its resources thinner. However, this could result to a waitlist which is even longer. The long-term fix to this problem is to start by improving funding which will then lead to benefits especially with physician health and therefore performance. Medical education also needs to change where more sustainable methods are promoted rather than traditional medical interventions. However, from this article the only sure thing is that something must be done otherwise the NHS will suffocate and we lose healthcare

Is China's economic influence on Africa truly a sustainable source of development?

LENNY KINARO

While some Western historians may have resulted to the conclusion that Africa has nothing to offer besides beautiful landscapes and its great climate. This is not the case. In fact, now, it is far from it. As described by Tim Marshall, former Sky Sports editors, as the land of 'lovely beaches', Africa has since begun to transform its economy, attracting vast amounts of foreign investment. This is evident through reported average annual growth in GDP of 4% across Sub-Saharan growth. Although, one nation has remained forefront of African investment in the last four decades. China. With a reported investment of over 20 billion dollars into African countries, particularly into infrastructure development and natural resource extraction, much of Africa's recent economic growth can be attributed to China. While some may argue that China's engagement in Africa was vital in the continent's development, concerns have been expressed on whether China's economic influence on Africa can truly be a sustainable source of development, or could it potentially harm African economies in the long run. This essay will aim to explore the question on whether China's economic influence on Africa can truly be deemed as a sustainable source of development.

Has China's economic influence on Africa truly helped Africa develop?

With the Chinese government and private sector reportedly investing over four billion dollars annually in recent years, it is impossible to argue that China's engagement has been inconsiderable. These investments have aided governments 'fast-track' the development of vital infrastructure projects such as the construction of roads, ports, and bridges across twelve different countries across the continent. For example, at a cost of 3.6 billion dollars, the Kenyan government was able to construct one of its most expensive infrastructure projects while only financing 10% of the cost, with 90% being financed by the Export-Import Bank of China. Kenya's Standard Gauge Railway (SGR) has been able to half the passenger travel time from Nairobi, Kenya's capital city, to Mombasa, East Africa's main port, all whilst creating at least 150,000 new jobs whether directly or indirectly. As a result, since its unveiling in the second quarter of 2017, Kenya has been able to largely increase exports to international markets, thus boosting tourism to the nation. This was clearly reflected in Kenya's 34.4% growth in GDP over a period of only 4 years after SGR begun operating. This is simply unheard of.

Furthermore, in addition to China's economic influence on Africa, the nation has even provided a vast number of scholarships to a plethora of students from the continent, all as a result of China's engagement in Africa. Enabling these kids to further their education in China, not only allows them to qualify for higher-skilled, higher-paying jobs in the tertiary or quaternary sectors, which would then generate more taxes for African governments to aid in providing more services, but would also increase innovation in the continent. And in the wise ideology of the late Steve Jobs, innovation breeds creativity, a vital trait for development.

Does China's economic influence on Africa contain any underlying negative consequences?

Although on the surface it may seem as if China's economic influence in Africa has been completely beneficial, the nation's engagement in the continent has without a doubt come with its own challenges. The major criticism of the concept, is the vast amounts of debt it has buried African countries in. Many African countries have borrowed large amounts of money from China in order to finance large infrastructure projects. Many are sceptical and have expressed their concerns regarding the sustainability of these loans, and the likelihood they may cause a debt crisis in future.

Moreover, critics of China's investment into Africa argue that natural resource extraction projects, financed by China's private sector, are harming the local communities. This is simply due to the fact that the extraction of these natural resources like gold in Uganda, are designed to maximise yield. As a result, these projects have seen to cause social unrest and environmental degradation, while the local communities feel as though they do not receive adequate compensation for the loss of their natural resources. As all projects funded by Chinese investment have been top-down development projects, they have largely benefitted the minority rich in Africa. As a result of this, the majority of the concepts critics come from Africa's majority poor population, benefitting in no form other than the masses of jobs created through Chinese engagement.

Is China's economic influence on Africa truly sustainable?

Although, over the last four decades China's financial engagement in Africa has proved incredibly fruitful, whether Africa's growth as a result is truly sustainable, is a complex issue. For a model or concept to be deemed sustainable, it must have the ability to remain at a certain rate or level, in this case, the pros must continue to outweigh the cons. Although, concerns have been made on whether this shall be the case.

With China's influence in Africa receiving large amounts of controversy, and the nation becoming notorious for performing debt trap diplomacy. Essentially, this is a term coined by Brahma Chellaney, Indian academic, used to describe the method in which China is able to gain geopolitical power, though leveraging the debt owed to them. Although economic analysts have described this idea as a 'distraction or even as a 'myth'. In August 2022, the Chinese Ministry of Foreign Affairs released a statement, claiming it would be forgiving a total of 23 interest-free loans, to 17 benefitting African countries. Thus, inclining the public to believe that contrary to popular belief, China is really investing in Africa with no impure intent. Although, this could not be further from the truth…

Conclusion

While it may seem to as though all the Chinese investment has aided Africa's economy to grow, I believe this is simply the consequence of other factors, with the China's influence on Africa bound to collapse our economy. Not only will African countries be unable to pay the high-interest loans, far from industry standards, but since the China's engagement in Africa begun, they have suffocated local development in every method possible. Firstly, through China's investment into Africa, Chinese immigration to Africa has sky-rocketed, with citizens searching for economic opportunity. The large majority of these Chinese citizens have then started their own businesses. Although, as they are very highly-skilled they are able to thrive at all levels, including manufacturing, retail and whole-selling. Hence no local participation in the whole chain of business. In addition, the state subsidises the large majorities Chinese-owned businesses. As a result of this the vast majority of multinationals and local companies are simply unable to compete with the unfair competition with these Chinese companies producing high quality goods while selling them at low subsidised costs.

In addition, Chinese-owned businesses tend to hire majority Chinese workers with few low-paying jobs being given to locals. As a result, they hardly transfer technology to locals with little to no training, thus hindering these locals from getting high-skilled jobs later on. Therefore, although the overall Kenyan economy is growing, this is due to its Chinese inhabitants, with locals suffering due to their occupancy.

In conclusion, although from a distance, it may seem that Chinese economic influence is truly benefitting Africa's economy due to the continent's exponential growth in GDP, this has largely come as a result of our large increase in population and increased Chinese immigration to the continent. In reality, the meteoric rise in Chinese immigration to Africa has caused masses of unforeseen consequences damaging local Kenyans, while the Chinese government continue debt-exploiting African countries for their own geopolitical gain. As a result, China's economic influence on Africa is not a sustainable source of development at all. I believe we

must urgently replace this source of development before Africa's debt interests accumulates to an amount unreasonable to pay back.

I propose, debt interest must be relieved or at least lowered to industry standards, enabling countries to pay back these loans. All whilst, trade with African nations is encouraged to develop Africa utilising a method that will allow locals to gain skills whilst boosting our economy. As opposed to foreign aid, which for the last few decades has been the norm. This has evidently not worked effectively as still today 511 NGOs exists in Kenya's largest slum, Kibera, covering a area of 2.5 square kilometres. Although these NGOs have received hundreds of millions of dollars in foreign aid, there has been little to no development in the area.
To summarise, I think it's undoubtable that China's economic influence on Africa has had an immense negative effect on modern African Economic development. While we must adapt to a system a more sustainable system able to fuel African development, 'The stories of the past are the drivers of the future. To know these stories is to be prepared for the future.' Glory Emmanuel

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How sustainable is AI trading?

SERIAN PATEL

Artificial intelligence (AI) trading has grown in popularity in recent years due to its ability to process large amounts of data and make predictions based on patterns and trends. AI trading has the potential to revolutionize the financial industry by improving efficiency, reducing costs and increasing profits, but there are concerns about its long-term sustainability. This essay explores the sustainability of AI trading and the challenges it poses.

One of the biggest challenges in AI trading is the lack of transparency. Many AI models used for trading are considered "black boxes". That is, its decision-making process is not easily understood or explained. This lack of transparency raises accountability issues as it can be difficult to determine who is responsible for losses caused by flawed algorithms. Confidence may be lost and future adoption may be limited.

Another concern is that AI trading may exacerbate market volatility. Because AI models are designed to recognize patterns and make predictions based on historical data, they tend to amplify market trends, which can lead to more extreme asset price volatility. This can have destabilizing effects on the financial system, especially during periods of market stress and uncertainty. AI trading also faces challenges related to data quality and bias. AI models are only as good as the data they are trained on, and if that data is biased or of poor quality, the resulting predictions can be inaccurate. There is also the risk that existing biases against financial markets will be reinforced. B. In relation to race or gender, if the AI trading model is not designed with diversity and inclusiveness in mind.

Despite these challenges, the sustainability of AI trading has potential benefits. For example, AI commerce can reduce costs and increase efficiency by automating many tasks currently performed by humans. This could result in lower fees for investors and greater access to investment opportunities, especially for those who may have been underserved by traditional financial institutions.

Additionally, AI trading has the potential to improve risk management and reduce fraud by identifying anomalies in trading behavior that may indicate fraudulent activity. This could improve the health of financial markets and increase investor confidence. This means that the use of AI trading could be converted into a measure of security rather than an active player in the market.

Several measures can be taken to ensure the sustainability of AI trading. First, we need to increase the transparency of AI trading algorithms and decision-making processes. This can be achieved by using explainable AI models or by requiring financial institutions to disclose the inside and outside of AI trading systems.

Second, financial institutions should prioritize diversity and inclusiveness when developing AI trading models, so as not to amplify existing biases in financial markets. This can be achieved by using different datasets and incorporating ethical considerations into the design of AI trading systems.

Finally, AI trading should be continuously monitored and supervised to ensure that it does

not exacerbate market volatility or pose systemic risk to the financial system. This can be achieved through the use of stress tests and other risk management tools. In summary, AI trading has the potential to revolutionize the financial industry, but its sustainability is challenged. These challenges include lack of transparency, potential market volatility, and concerns about data quality and bias. Ensuring the sustainability of AI transactions requires greater transparency, diversity and inclusion, as well as ongoing monitoring and oversight. Addressing these challenges can help unlock the potential benefits of AI trading while minimizing risk.

What makes Sweden one of the most economically sustainable countries in the world?

HAYMAN LAI AND AMBROSE NG

What makes Sweden so economically sustainable?
Sweden has been most renowned for being one of the leading economies globally not only in its size considering its relatively small population but also in terms of sustainability. This could be backed up by Sweden's rankings in indexes that measures economic sustainability, for example Sweden ranked eighth across the globe in the latest Sustainable Economic Development Assessment, that measures a country's economic sustainability, environmental sustainability and social inclusion to provide a measure of sustainable economic development. Sweden also ranked seventh globally in the Human Development Index, which measures a country's economic development by considering indicators such as life expectancy, education and income. But what are the driving forces behind Sweden's success? In this essay, we are going to briefly discuss how government spending, renewable energy, innovation and technology, as well as a developed social welfare system, all contributed in protecting and enhancing factors of production in the country, and ultimately achieving more economic sustainability.

Renewable energy
Sweden has been investing in renewable energy which helps the country become economically sustainable, in the long term. With an increasing number of immigrants and birth rate each year, the quantity demand of energy has been gradually increasing. As a result, this increase in usage of energy has prompted the Swedish government to invest in renewable energy, such as windmills and hydroelectric power, to ensure that the demand for energy is met by securing a long-term energy supply. Currently, Sweden has more than 1900 hydroelectric power stations operating across the country, with hydroelectric power being responsible for over half of Sweden's electricity production. This therefore creates jobs and keeps the electricity price at a lower level – the average wholesale electricity price in Sweden was 80.66 euros per megawatt-hour in 2023, which is an 8.5 percent year- over-year decline – allowing electricity to become more accessible for households in Sweden. Not only is this investment economically sustainable, but it is also environmentally sustainable, as these renewable energy generating methods do not pollute the environment. Due to this improvement in economic sustainability, the government will therefore be able to re-allocate resources for producing renewable energy more efficiently. This means that in the longer term, the cost of factor of production will decrease, which directly affects the short run aggregate supply, causing the SRAS to shift downwards, thereby pushing down the price level of electricity. At the same time, this will lead to a long term increase in the real GDP of Sweden; in 2021, Sweden has a GDP of 635.7 billion USD, which relates to a 5.1% GDP annual growth. Therefore, investments in renewable energy have led to Sweden becoming more economically sustainable. However, despite the decline in cost of energy that renewable investments bring about, the reality is that Sweden's energy prices are still high. Firstly, this is because there is only a minimal amount energy generated by renewable sources, in comparison to non-renewable energy, such as fossil fuel. Secondly, is because Sweden is part of a common

energy market in Europe, and the energy prices in Europe has been skyrocketing due to the Ukraine war. In addition, the impact of the energy price drop depends largely on its price elasticity of demand: if energy is price inelastic, a large amount of price drop will only translate to a small increase in quantity demand. This means that, lowering the energy price might not be an effective means to achieve economic sustainability.

Government spending

The Swedish government allocates its spending in a way which economic sustainability could be achieved. Government spending is one of the four components that determines aggregate demand, which directly reflects the real GDP of the country. Therefore, government spending is one of the main factors that affects economic sustainability in Sweden. On the demand side, increasing government spending on public administration, such as education funds and law enforcement management, will lead to short term economic growth. For example, in 2019, Sweden spent 15.90% of it spending on education; this has not only led to higher levels of human capital, such as skills and experience, but also a more positive attitude for human input and thus higher productivity, causing a rise in aggregate demand. This in turn will lead to higher employment rate and increase in disposable income. As a result of real income increasing, consumers will have more purchasing power, and there will be more spending on outputs, allowing Swedish firms to earn more profits. Thus, firms will be pushing up their price level in order to maximise profits, ultimately leading to inflation, and the positive impact of inflation is what upkeeps economic sustainability. In addition, higher productivity will also lead to a left shift in long run aggregate supply, which boosts economic growth. Consequently, leading to the Swedish government receiving more tax revenue; the personal income tax rate of Sweden is 52.3%, and this enables the Swedish government to spend more on infrastructure investments. For instance, spendings on transport will also increase productivity as workers could travel to work more efficiently, therefore causing the cost of factor of production to decrease. As a result of this, the short run aggregate supply will shift right, causing price levels to decrease and output to increase. This means that products will become more competitive, and firms will therefore have higher profit margins, causing the corporate tax to increase; in 2021, the taxable income of Sweden is subject to corporate tax at a flat rate of 20.6%. Ultimately, this also leads to an increase in government tax revenue, and therefore a circular flow of revenue is established and long-term economic sustainability can be achieved.

Innovation and technology

Stepping into the 21st century Sweden has slowly emerged as one of the leading innovation powerhouses in Europe, being home for internationally well-known tech companies such as Spotify, Skype, Klarna and Ericsson. This could be well reflected by global rankings of the Global Innovation Index, which sees Sweden, a country only with a 10 million population, ranking third globally, just narrowly behind Switzerland and the United States. All of Sweden's successes in the technological sector stems back to a few factors, and its unique education system is one of them. Sweden's Education Act back in 1982 states that all students should be able to access equal education regardless of their social and economic status, which by granting students the chance to be educated means that more skilled individuals and workers are created; about a third of Sweden's population has post-secondary education. Sweden's education system is also student-based, which means that it is entirely based on what the student is interested in; exams and tests were also scrapped off so that education would be driven by the students' own interests and would focus on quality over quantity as syllabuses would not have been rushed to meet exams and tests standards; learning is also project-based where students are given projects to work on, such as solving world problems, thus helping students develop problem solving skills, creativity and collaboration skills. In addition, the Swedish education system, particularly tertiary education, places extra emphasis on research which helped develop a culture of innovation and creativity. Collaboration with industry is also promoted to bring academic research into the real world into practice. The well-developed education system thus ferments a well-established start up culture in Sweden, which has gained immense success, with Stockholm being rated the second-best city in Europe for start-ups and it is estimated that there are 10000 start-ups in the country right now. Work-life balance, that offers flexible working hours and parental leaves that prioritises employee well-being. On top of that, government policies catalyse the development of technology and innovation through funding and material support. For example, the government provides funding and support through the Swedish Agency for Economic and Regional Growth (Tillvaxtverket) and the Swedish Innovation Agency (Vinnova). There are also incubators and accelerators such as STING and Norrsken that provides mentorship and material support. With all these factors boosting Swedish technological and innovation sectors, it enables Sweden to continuously export its technology and brand-new products to other countries, creating a continuous income source and more job opportunities. It also helps cut costs in industry and other businesses through automating routine tasks and increasing efficiency, thus allowing more productivity and more capital to be invested to other sectors of the country, such as constructing its social welfare system or even back in the innovation sector, and even enhancing competitiveness of companies through improvement of products and services achieved by technological advances. On top of that, Sweden's advanced green technology research also allows Sweden to develop their economy while minimising damage to the environment, which is one of the main factors considered when assessing economic sustainability in a country.

Social welfare system

Sweden is well known for its comprehensive and generous social welfare system, which aimed to provide material support to those in need, with a particular emphasis on promoting economic sustainability. According to the Organisation of Economic Cooperation and Development, Sweden's social spending accounted for 29.2% in 2019, which is way above the OECD average of 20.5%. Such generosity is echoed by a carefully designed social welfare system, which includes: (i) universal healthcare, which is publicly funded and provides coverage to all Swedish citizens and residents; (ii) paid parental leave, providing up to 480 days of paid leave to new parents, which parents are entitled to 80% of their original salary; (iii) children subsidies which has an allowance up to 1250 Swedish Krones per child per month, aiming to support working parents and thus promote gender equality; (iv) a study allowance of 1250 Krones per month that funds students to pursue higher education regardless of their financial conditions, and (v) a mandatory unemployment insurance system, which provides a replacement income of up to 80% of the individual's previous income. This results in Sweden having one of the least unequal societies (Gini coefficient of 0.28 compared to global average 0.63), and one of the countries with the least proportion of population living in poverty (5.5% of the population living in poverty, in comparison to EU average of 16.9%). In addition, Sweden's well-developed social welfare system greatly helped improving economic sustainability.

This is because through cash transfers, allowances and subsidies, economic stability of individuals increases, thus allowing them to participate in the market more often as consumers, investors, etc. Also, Sweden's social welfare system provides access to high quality education that can improve educational outcomes, creating a more skilled workforce, which is essential for long term economic growth. On top of that, quality education also provides opportunities for upward social mobility, which contributes to economic sustainability as individuals who moves up the social ladder will be more likely to contribute to the economy through taxes and consumer spending. In addition, a developed social welfare system promotes social stability through reducing inequality, thus attracts more foreign investment and business developments, which all stimulate economic growth.

In short, the combination of generous yet careful government spending, promotion in the development of renewable energy and other innovative technologies, and a comprehensive social welfare system resulted in the successes Sweden has achieved. But economic sustainability could not be achieved overnight: in the case of Sweden, it was the idea of a national pension system and health insurance in the early 1900s that kickstarted the process, the establishment of ministries such as the Swedish Environmental Protection Agency established in 1972 and Swedish National Agency for Education, established in 1946, and a prudent approach to future planning that created such outcome.

Marx's Ecology

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To say man's physical and mental life is linked to nature simply means that nature is linked to itself, for man is a part of nature. – Karl Marx

Common understanding of Marxist economics is rather superficial. State ownership, proletariat power, automation advancement. Idealistic but impractical. It is the critiques of both Marx and Engels, misconceptions perhaps, that most engagement with these thinkers occurs through the lens of. Of course, this skewed perception. One misunderstanding is that his writings are just scathing attacks on capitalism, briefly touching on a simplistic, unrealistic solution: pass technology from capitalists to the workers. Another is that Marx's post-scarcity economy, derived from technological advancement, relies upon environmental exploitation. This misconception likely stems from the fact that certain regimes which align themselves with Marxism, such as China or the Soviet Union, are not exactly known for their ecological stewardship. Environmental culturalist Victor Ferkiss claims Marxism can be characterised by a "virtual worship of modern technology", implying a blatant disregard of the natural limitations of environment. Marx is assumed to have dictated that the proletariat should not only be victors over the upper classes, but over nature itself. This is an easy misconstruction of Marx and Engels' writings.

Marx was not a parochial thinker. That would not be sound means of becoming one of the most impactful figures on academic thought. Economics professor Ravi Bhandari wrote that Marxism was "the first systems theory", referencing the breadth of Marx's work. His perspectives on sustainability are less accessible than those on class divide, revolution, and religion. However, once his ecological writings are located, they reveal themselves to be remarkably ahead of their time. Marx's critiques of capitalism were not exclusive to the exploitation of labourers, but include the exploitation of nature, in much detail at times. Alongside Engels, he developed an integrated approach to a world after capitalism, one focused on repairing the rupture in the relationship between humanity and the rest of nature. In typical Marxist fashion, these writings contradict some established environmental theories. It seems appropriate to introduce some of Marx and Engels' thoughts alongside a couple of the ideas they seem to be at odds with.

Marx's theory of alienation describes the estrangement of humans from their true nature. While his more prominent works describe the alienation of workers, his thoughts on human alienation from nature receive less commentary. Marx theorised an "irreparable rift in the interdependent process of social metabolism", an idea which has come to be known as the metabolic rift. This describes capitalism's irreversible disruption of natural processes. When formulating his theory, he drew upon the work of Justus von Liebig, who was the first to identify and explain the role of soil nutrients in plant growth. Marx highlighted that capitalist agricultural advancements only exacerbated "robbing of the soil", as well as "robbing of the worker". The disruption of nutrient cycles occurs through the abuse of inorganic fertilisers, constant cultivation, excessive grazing, and the prevention of "the return to the soil of its constituent elements consumed by man in the form of food and clothing". Marx identified soil quality as a reflection of the present mode of production, just as he does with the conditions of workers. Marx continues to draw a parallel between agriculture's exploitation of soil and industry's exploitation of the worker. The separation of man from nature mimics the alienation of man from his labour. The sapping of nutrients mimics the "crushing out of the workman's individual vitality, freedom and independence…" According to Marx, both processes have a common cause: capitalist production.

The Tragedy of the Commons is often used as an easy rebuttal to Marx's writings on land and collective ownership. Garret Hardin proposed the theory in 1968, arguing that the sharing of resources paves the way for destruction of these very resources. His tragedy is Aristotelian, an unintended but inevitable outcome. The Californian professor asked readers to "picture a pasture open to all". This demand seems ignorant, given that this is not how shared resources have been historically organised. Regardless, Hardin reasoned that each "rational herdsman" will deduce that adding another cow to the cattle will solely benefit him, while the costs of this action are shared by all. Inevitably, all herdsmen have these eureka moments until the commons are abused, exploited to the point that no cattle can survive on the barren land. In other terms, economic agents acting in their own interests causes negative externalities in production, leading to a missing market. Consistently used as a lazy justification for poverty amongst agrarian communities and the necessity of land ownership, the theory blames human nature itself for societal failings.

Friedrich Engels once labelled an almost identical argument as a "repulsive blasphemy against man and nature". The sacrilege of Hardin's essay lies in its fiction. Man is not naturally inclined to exploit nature. Both historically and contemporarily, common ownership has fostered sustainability and egalitarianism. Examples include irrigation systems, mountain villages, and fisheries across the globe. The incentive to act egocentrically must have source other than human selfishness. According to Marx, capitalism "stands in contradiction to agriculture". While sustainable farming must consider the "gamut of permanent conditions of life", capitalism is solely "oriented towards the most immediate monetary profits". In competitive markets, businesses are forced to maximise short-term profit to survive. Private owners are rewarded for anti-social behaviour, behaviour that reaps individual benefit at the cost of the collective. This cost is the exacerbation of the metabolic rift. Thoughts of sustainability are compartmentalised in capitalism's ruthless markets (unless, of course, marketing your ecological heroism leads to additional profits). Engels synthesises this idea efficiently, writing that "In relation to nature… the present mode of production is predominantly concerned only about the immediate". Hardin's theory assumes the current means of production… hence the tragedy.

Larry Fink, CEO of Blackrock (the worlds largest asset management firm), recently provided us with a solution to almost irreversible environmental damage: capitalism. In a sustainable brand of shareholder capitalism, he makes the bold claim that "We focus on sustainability not because we're environmentalists, but because we are capitalists and fiduciaries to our clients". This is a reimagination of the Friedman Doctrine. Milton Friedman argued that the sole social responsibility of a firm is to increase profits and maximise shareholder returns. Fink expands upon the shareholder theory, arguing that acting in an environmentally beneficial way is part of a company's duty to protect "the long-term economic interests of your shareholders." Employing the power of capitalism to save the world is a compelling argument. It is certainly convenient for the CEO of a firm with a market capitalization of just under one hundred billion.

Acting sustainably for the maintenance of an economic system is flawed. The economic system in place must be inherently sustainable. Fink believes that the duty of a firm is to act in service of shareholders economic interests. This is fundamentally homocentric. Placing shareholders on a pedestal implicitly places humanity on a pedestal. This is what makes shareholder capitalism unsustainable. Engels explains why, reminding us that "we by no means rule over nature like a conqueror over a foreign people". This perceived relationship leads to nature's exploitation and alienation. Striving further from our natural state or further damaging our natural habitat

is somehow viewed as victory. Engel's highlights the danger of this outlook: "For each victory, nature takes its revenge on us… it has quite different, unforeseen effects". These can otherwise be described as negative externalities. Marxism avoids this through holism, the consideration of not only every part of a system, but the interconnectedness of parts and structures. The biosphere, which encompasses all living and non-living mater is the system. Human society is a subsystem, of which the chosen mode of production is a subsystem. Economic approaches cannot be solely concentrated on human interests and should instead consider the whole. This includes nature.

Upon reflection, validating Marx's ecological theories demands practical examples. Further research reveals that this application has occurred. In Soviet Russia, before the detrimental intervention of Stalin, a glimpse of the potential of Marxist ecology could be seen. The Bolshevik government were committed to the unification of theory and practice. On the academic side, ecological studies progressed at unprecedented rate, with Soviet scientists accelerating ahead of international counterparts. The term biosphere was, in fact, coined by Russian mineralogist Vernadsky during this brief period. Decrees on land and forests established practical means of improving ecological sustainability. Zapovdeniki, which translates to nature reserves, were established, inviolable to human intervention to aid scientific investigation as well as the environment. This were the original national parks. Organisations were founded to protect nature that was now publicly owned from those with malicious intentions, a task they undeniably fulfilled. These impressive developments took place under a government that was threatened by both national and international powers. While fleeting, the period seems to be a promising case study for Marx's ecology.

WHOLE PERSON WHOLE POINT

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